AMERICAN MACHINIST

A JOURNAL FOR MACHINISTS, ENGINEERS, FOUNDERS, BOILER MAKERS, PATTERN MAKERS AND BLACKSMITHS.

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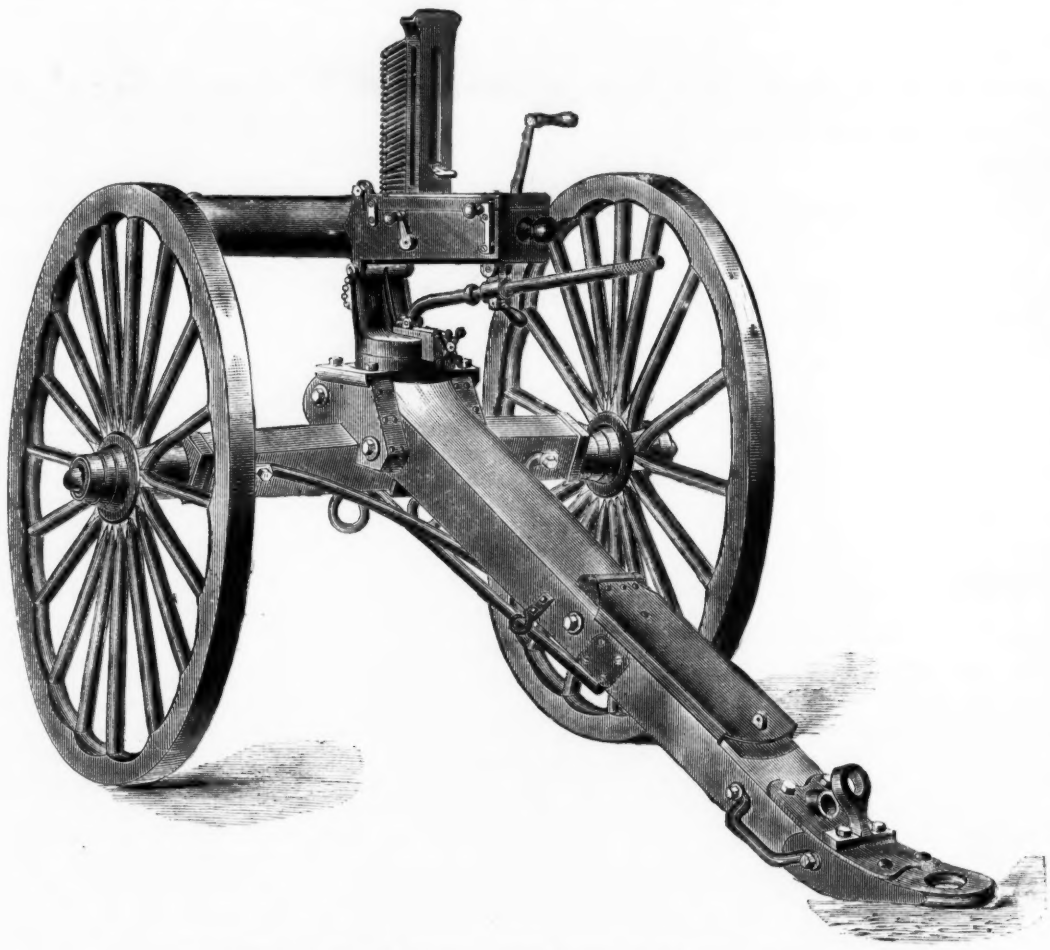
The Gardner Machine Gun.

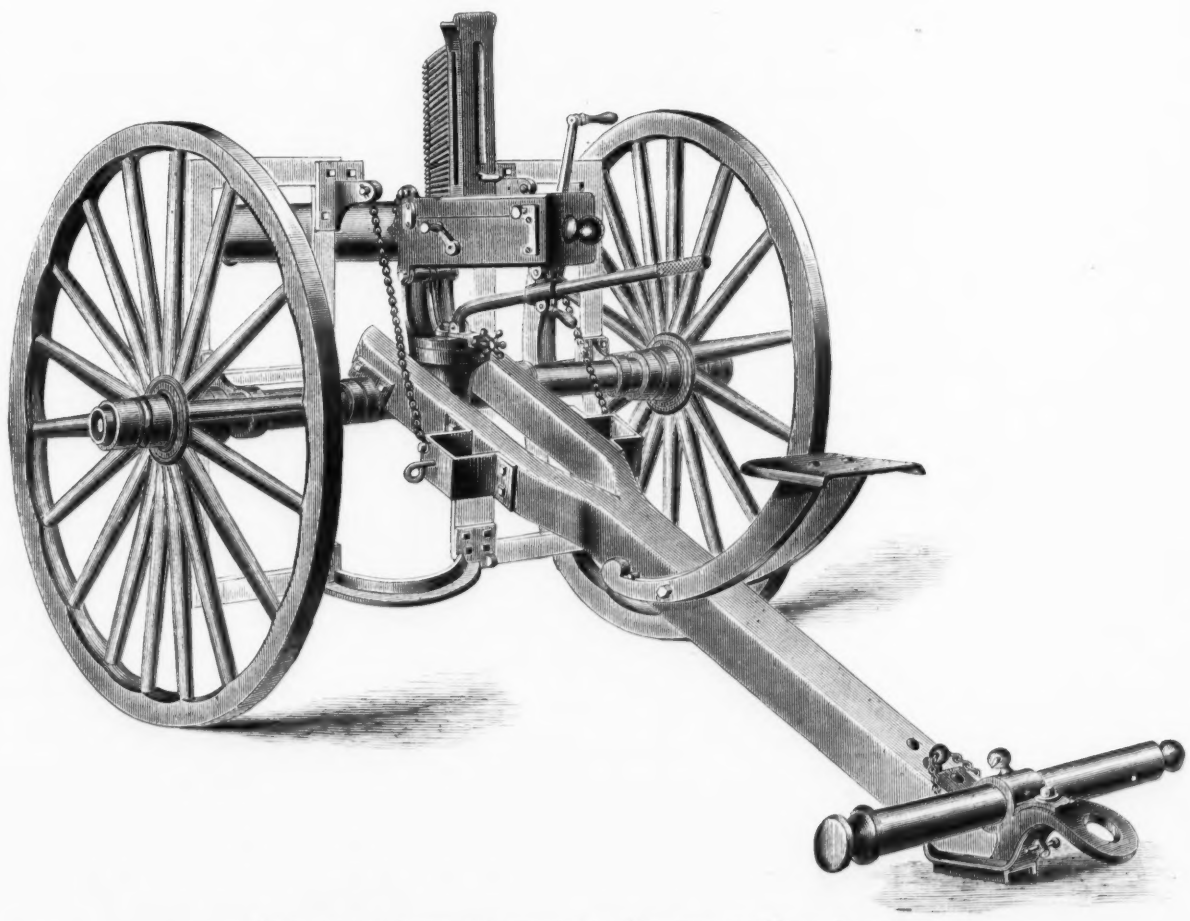
The application of machinery to almost every occupation of life is making remarkable progress in all civilized countries. In devising and improving machines for human destruction no lack of effort has been observed, and the results in this direction tend to render wars more "short, sharp and decisive" than ever before. It is hard to conceive how men exposed in action to the terrible fire of such a weapon as the Gardner Machine Gun can withstand the conflict even a short space of time. The original gun was invented by William Gardner, Toledo, O., in 1874. In the following year arrangements for the construction of the gun were made with The Pratt & Whitney Company, Hartford, Conn., who are now the manufacturers and owners of the patent. The U. S. army and navy departments have made at different times the most thorough trials of this weapon, the first being in November, 1875, and the last a few weeks ago. In all of these trials it has shown wonderfully successful results. It has been greatly improved since the first trial, one of the principal changes being the adoption of Parkhurst's simple and efficient feeding apparatus.



IMPROVED GARDNER MACHINE GUN MOUNTED ON ARMY CARRIAGE.

The system of swinging levers (known as the Gardner system), that transfer the cartridge from the feed guide to the perforated plate, with the help of gravity, have been superseded by a system that positively carries the cartridge to its place, and retains the shell in position until it is ejected.

We present on this page and the one following, engravings of the gun as lately improved.



IMPROVED GARDNER MACHINE GUN MOUNTED ON NAVY CARRIAGE.

The improved Gardner gun, as shown on tripod and carriages, consists of two simple breech loading rifled barrels, placed parallel to each other, about 1.4″ apart, in a case or compartment. These two barrels are loaded, fired and relieved of shells by one revolution of the hand-crank. The working of the gun is simple. One man inserts the heads of cartridges projecting from a feed block into a feed guide, drawing the block from the cartridges; another man turns the crank, by which the gun is fired, and, as the cartridges disappear down the feed guide, their places are supplied from another block; in this manner the firing may be made continuous. The barrels are open from end to end, and chambered at the rear to admit a flanged center fire metallic cartridge. The barrels are firmly screwed into a rear barrel ring, which is pinned fast to the rear case, and the muzzles pass through another similar ring called front barrel ring, which is fitted into the front case and made fast with a taper pin. The rear case extends from rear barrel ring far enough to contain all lock parts, together with the driving crank and safety stop. A swinging cover, hinged at forward end of case, is firmly locked in position by a cascabel, having a screw thread cut on its stem that enters the rear case. When the cover is raised, which can be quickly done after turning back the cascabel, all the working parts of the gun are fully exposed; and should an accident occur, like the bursting of cartridge heads, or derangement of locks, the trouble can be instantly discovered, and as quickly remedied. The hand crank that operates the gun is pinned fast to the main crank, which is supported by journal boxes. The boxes are locked into the rear case, and serve as a protection to the swinging cover from side thrusts. The body of main crank is circular, having journals or crank pins for operating the locks, diametrically opposite each other (the firing being alternate), and eccentric enough to give the required motion to the locks as they are moved forward and back, driving in cartridges and withdrawing shells. The outer portion of crank pins or journals are flattened to the circle of the periphery of main crank for the purpose of holding the lock stationary while firing, about one-fifth part of revolution of hand-crank, and allowing ample time for hang fires. The lock in form resembles the letter U, having an extension from its side, which contains the firing pin, main (spiral) spring, sector or spring compressor, sector-sleeve, extractor, and lock head. The U part of the lock, that works under and around the crank pin, is curved at the inner front to correspond with the outer circle of the crank; the office of the curved front being to hold the lock in position for firing. The circular firing pin is flattened a portion of its length near the front end, to allow it to pass under the extractor by which it is held in position. It extends from the head of the lock through the main-spring and sector sleeve, terminating in a flange or head, for locking into a sear. The sear, having the form of a bell crank, pivoted in the center to the lock, holds the firing pin securely, and prevents it from touching the cartridge until it is released from its hold by the action of the crank journal when the lock is in its extreme

forward position. The sector, or spring compressor hinged in a recess of the lock, and engaging, by means of gear teeth, with the sector-sleeve, has its arm forced against the safety stop as the main crank advances, thus compressing, through the medium of the sector-sleeve, the mainspring, and holding it tense until released by action of the gear.

The lock heads serve as breach plugs, and receive the recoil when the cartridges are fired. Each lock carries a hook extractor, which rides over and catches the flange of the cartridge, when the lock is forced forward, and when the lock retreats, withdraws the empty shell until it comes within reach of the ejector, by which it is positively thrown out. The shell starters have a positive movement in connection with the lock head. Should the cartridge be driven by the extractor into the barrel to its head (as is the case when the gun is worked rapidly), before the lock is in firing position, it is forced from the chamber by the shell starter as the lock advances, and is held long enough for the extractor to engage with the head, when the lock, extractor, and cartridge are driven home together.

The ejectors, hinged to the case, are driven by projections on the sides of the locks which give them positive movements to eject the empty shells. They also serve as stops to prevent cartridges from falling through the perforated plate as they are forced down through the feed-valve.

The perforated case extending across the rear case, to which it is fastened by a pin, has two parallel semi-circular grooves, which are enlarged extensions of the chambers in barrels. From the back part of the groove, slots large enough to pass freely the cartridges (being wider at the rear, behind the ejector, than at the front), are cut downward through the plate. When the retractor has drawn the shell back nearly to the extent of the throw of the crank, the ejector forces the shell through the slot, and is then in position to receive another cartridge from the feed plate or valve. The feed valve, attached to the swinging cover, has a reciprocating motion across the perforated plate. It has two angular openings of the size and shape of the outline of the cartridge, with centers equidistant with centers of barrels. After a cartridge has dropped one-half its diameter into the valve it is forced, by the action of the latter, into its true position, and held positively against the cartridge support. When the valve is again moved back, the cartridge is forced downward into the perforated plate, and the column of cartridges is cut off in the swinging cover feed ways, which are extensions of the feed guide that is located above and in line with the perforated plate.

The feed valve is driven by the feed plate lever; this also is attached to the swinging cover, and is operated by the locks, using about one-eighth the stroke of the crank in its forward motion, thereby giving the valve ample time to hold both cartridge and shell down in position, as they move in and out from the barrel. The feed guide is a simple plate having two parallel T-grooves, extending from end to end, their centers equidistant with the centers of the barrels. The upper end of the guide has a trumpet-shaped mouth to facilitate the entrance of the cartridge heads. The lower end is provided with a cartridge stop, which lifts all cartridges contained in the guide when it is taken out from the swinging cover by which it is supported. The guide is held fast in firing position by a spring catch. It can be quickly released by drawing back the spring catch by pressure on its exposed arm. In placing the guide in position, the spring catch becomes self-acting. These operations require but one hand, leaving the other free to place the safety-stop arm in position. The safety-stop is an oblong block having an angular face against which the arm of the sector in the lock may engage when the locks are moved forward by the crank. It is held in position by two links which are moved by an arm that is pinned fast to a shaft passing through the rear case, to the outer end of which is pinned the stop arm. This arm is constructed in the form of a hand crank, having a stop spindle placed in its handle, behind the shoulder of which is place a spiral spring that forces the spindle out from the arm into the stop holes, two in number, in the rear case. When the stop spindle is in the upper hole, the arm is in line with barrels, the safety stop is thrown within reach of the sector arm by which the main springs are compressed, and the gun is in firing position. When the spindle is in the lower hole the stop is carried forward out of the way of the sector arm, and in no case can the springs be compressed while the safety-stop arm is down.

THE GARDNER MACHINE GUN MOUNTED ON TRIPOD.

We take the following brief extract from the report of a recent trial made to Commander Jeffers, Chief of Bureau of Ordnance, Navy Department:

"The trial of the gun took place on the 17th inst., ten thousand rounds being fired. The cartridges used (brass shell with reinforced folded head; outside primed; weight of ball, 450 grains; weight of powder charge, 70 grains), were those of caliber .50, manufactured at Bridgeport, Conn., by the Union Metallic Cartridge Co.

"The gun was not provided with spare locks or any other spare parts for use in case of failure or accident. The only circumstance, however, which interfered to prevent the completely successful working of the gun occurred after 4,650 charges had been fired, when the extractor of the right lock failed to extract an empty shell from the right hand barrel. Several similar failures occurred in quick succession, and there being no spare lock to replace this one, it was found necessary to take it out and stiffen the extractor, and also file its hook slightly. After this had been done the experiments were continued, and the remainder of the ammunition was fired without any further trouble, the gun working perfectly in every respect.

"The ease with which this gun is worked deserves special notice. The crank is turned with little effort, and the speed of firing is only dependent upon the rapidity with which the person turning it can make his hand revolve.

"The gun is exceedingly simple in device and light in construction, weighing, with its tripod, 201 pounds, and without the tripod, 147 pounds."

LIMBER OF GARDNER MACHINE GUN.

In this trial 3,019 cartridges were fired in eight minutes thirty seconds, which is at the rate of 355 per minute; 649 cartridges were fired in one minute and forty-two seconds, which is at the rate of 408 per minute; 431 cartridges were fired in one minute; one hundred cartridges were fired in eleven seconds, which is at the rate of 545 per minute. With three ordnance men at the crank and two feeding, using the full traverse motion, in two minutes, fourteen seconds, 839 cartridges were fired at the rate of 376 per minute. The gun was carefully examined, and found in good working condition. The barrels were very foul and very hot, but the working parts were only moderately foul and worked as smoothly as at the beginning of the trial. Ten thousand cartriges were fired during this trial.

At the late Sydney International Exhibition, 872 exhibitors from New South Wales received awards, 858 from Great Britain, 467 from Germany, 306 from France, 240 from Victoria, and 201 from the United States.

Extracts from Chordal's Letters.

Mr. Editor:

* * * * I believe human nature has an ever-present hankering after shows. These shows may involve a rare combination of common things, or a simple exhibit of rare things. The common craving is always with me, and, in obedience to this craving, I have journeyed into a distant country in order to take in the Millers' International Exposition at Cincinnati.

* * * * This exhibition—the law ought to check the use of that villainous word "exposition"—is rare and vast In the first place, it is the first thing of the kind, and in the next place, it is well appreciated by exhibitors, who, as a general thing, are doing themselves credit by the display.

The international feature of it don't develop very strongly, the foreign exhibit being very delicate.

* * * * This exhibition includes the raw products used in the milling arts, the machinery of conversion, the motive power, the finished product, and receptacles for the product, thus reaching from seed wheat to paper bags for the baker. Wheat is brought on the premises, and fresh bread is eaten on the premises.

* * * * The millers' exhibition is pure business. There is no popular attraction, unless it be the catch-penny feature of amateur baking. The value of the show to interested parties is great, but to the populace the exhibition is hardly worth seeing. The admission is twenty-five cents, and could reasonably and, may be, profitably be placed at a dollar or more.

* * * * Foreign visitors have come in force. You may imagine them as permanent visitors who, with note book in hand, make a deep study of matter presented. Your imagination would, in this case, however, lead you far astray, for the mill man from Coventry, Bangkok and Ghent comes here one day and departs the next. With the foreigner, the millers' exhibition is simply a grand excuse for making the grand tour. This is, to my mind, the greatest benefit of the show.

* * * * It seems to be thoroughly established in the American mind that the whole world must look to us for all that is commendable in the way of manipulation and conversion. I am a skeptic myself on this point, for the reason that I have never seen a person firm in the above belief who had any means of knowing much about the matter. In short, the belief bears many of the characteristics of national prejudice.

The American who has traveled abroad seems comparatively quiet when he gets home. I have long since come to the conclusion that there are men and things in other countries.

* * * * I am not well enough posted in milling to speak of the real points of American and foreign systems, but I have become convinced that the American millers have got something worth having.

This something consists more in newly acquired knowledge than in machinery. Machinery is public, and the exhibitor at Cincinnati is doing his best to unfold merit. These machines are simply essential elements in broad processes.

* * * * A person would naturally say: If American millers get much of their "bread" and butter out of foreign patronage, why do they congregate in Cincinnati and invite their foreign competitors over to receive the knowledge which is the real basis of Northwestern success?

I took in the Cincinnati show, in company with one of the most advanced millers of the country, and he cased my mind at once by saying: "The Northwestern systems are not here."

* * * * I might, while here, send you forty or fifty columns of detailed notes of things, but the work of the gazetteer is not to my liking.

* * * * Have you ever noticed, Mr. Editor, how tenderly you have to handle mechanical subjects, to avoid advertising somebody? Did it ever occur to you, that every step which the world has lately taken

in adding to its wealth and happiness is generally traceable to the systematic efforts of individuals? Of late years, the whole world has organized a system of recognition of its benefactors. This recognition has taken the form of a limited monopoly for the inventor, and a monopoly governed by the law of the survival of the fittest for the producer. How can progress be hinted at in the mechanical arts, if the mention of names is improper? Must a man blush because, inadvertently, he intimates the existence of a benefactor, when he descants on a benefit? Surely we may talk of work done, and not blush that the worker gains by it. We may do this without sinking to the low vulgarity of the finer arts, in which the merit of the product becomes of less significance than the name of the producer.

The most excellent book I have ever seen on valve motions contains hardly a word regarding those motions which form the basis of the commendable systems. With the utmost respect for the author, I wish to enter my earnest protest against that mistaken delicacy which finds expression in such a sentence as this:

"It may prove a source of regret to some that the numerous class of automatic cut-off gears, now so extensively applied to stationary engines, should have received no special mention in this work. The author, however, has considered it most expedient to confine himself to general principles, and to subjects requiring a solution in every-day experience, leaving with those who hold such monopolies, and who alone can make use of them, the onus of explaining their principles and advertising their points of excellence."

* * * * Some man makes money out of every changing emotion of his fellow man. There is no vocation on earth, which is not founded on the tastes and opinions and requirements of men. How idle, then, to withhold information, because somebody will make by it. The managing editor of one of the most enterprising daily papers in the country said to one of his reporters last week: "That thing would be an appreciative piece of news, but I don't see how to counteract the gratuitous advertising it would result in."

* * * * Many of our standard works on mechanical subjects seem to have been based on intention of pointing out progress in the arts, without touching on anything under seventeen years old, which is the term of life of an American patent.

* * * * In some of the arts there is absolutely nothing good which is not patented. Some one individual holds the art in his grasp. The people have granted him his monopoly for a short time, in consideration of his making the thing public in order that all may enjoy it freely and fully, when the term expires. But for this reward, there would be comparatively no effort to benefit mankind.

* * * * This digression was suggested by something seen in the millers' exhibition. A reporter had absorbed the theory and practice of a new art, and had made copious notes. When done, he asked the exhibitor if the matter was free and unpatented. Exhibitor emphatically said *No.* Then reporter said he questioned whether he would be at liberty to refer to it. It was not a bid for pay, because the paper did none of that business.

* * * * The machinist who builds mill work don't care to have much to do with the work after it gets all mussed up with flour dust. In this exhibition, the average machinist will generally gravitate toward the space devoted to steam engines.

There are five automatic cut-off engines exhibited here; all are eighteen inch bore, running at six hundred feet per minute piston speed. The engines are the Brown, the Wheelock, the Buckeye, and two Hyphen-Corlisses, to wit: the Harris and Reynolds. There are six engines advertised to appear, but for some reason the sixth is not on hand. The engines are not only on exhibition, but are entered for competitive tests. Elaborate arrangements have been made for the tests, which will be conducted by Mr. Hill, an engineer well known in connection with this sort of work. There have been many engine tests at Cincinnati exhibitions, but this one is promised as the most complete and comprehensive of them all. All the engines are condensing, and the tests will include a ten-hour run of each engine, condensing, and a ten hour run, non-condensing. The code governing the tests has been published, and the results will probably be published also.

* * * * One important result may be hoped for from the Cincinnati engine test. The utility of condensers will be brought more prominently to the notice of American engine users. Here are five engines of fair size, to be thoroughly tested under similar conditions, with and without condensers. Of course, these elegant tests will not do to tie to for practical results, but they will furnish practical data, from which fair practical conclusions may be drawn, and it is to be hoped the condensation feature of steam engineering may be talked about as a result. When I say that nice tests will not do to tie to for hard practice, I mean that one practical element must be omitted in all scientific tests of machinery. The wages and ability of the man in charge of engine and fire-room are left out of the calculation. The test of refined machinery by a skilled and educated expert is a very different thing from daily work under an engineer at fifty dollars, or less, per month. The manufacturers of all these splendid engines are here in person, or by proxy. The engines will be well set. If there is a particularly fine point for the engines to take steam at, or to cut off at, or to release at, these men will know that point, and will see that the engines are working to advantage Sages will criticise the trial diagram, and skill will handle the wrench which adjusts the valves.

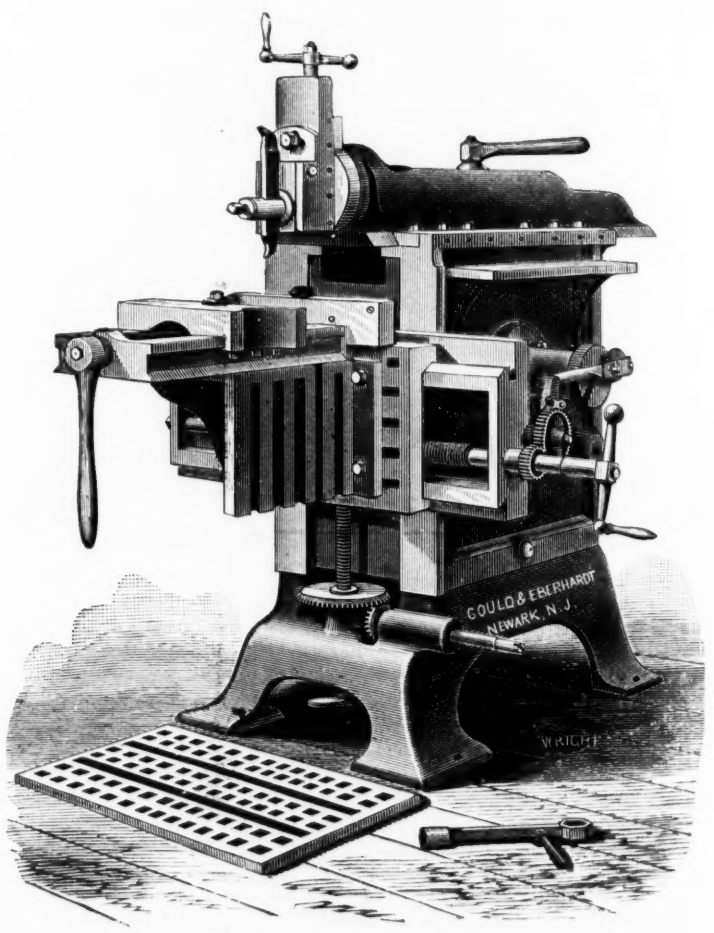
If engines would hold these points all would be well, providing all engines got as good a send-off as engines do when entered for competitive test. The ability to hold its points is, may be, the true test of an engine, after all.

* * * * The idea of the average mill man is, that a condensing engine is some new kind of a motor, which he must buy outright, throwing all the old rig away. These men would do well to watch these tests. Here are the non-condensing engines of the every-day mill, and in two days, without previous preparation of the engines themselves, they can be made condensing; as it is, all is fixed, and a turn of the wrist makes the change.

* * * * Why in the world don't somebody go into the condenser business, and offer the public some simple little rig, which can be set as easily as a feed pump, and change a non-condensing engine into a condensing one? No invention is needed. In fact, invention would spoil the whole thing. No new and untried principle of condensation is wanted, no new and untried air pump is wanted. A simple, cheap and compact combination of devices of well-established merit, is the thing for the business. The nearest approach to this thing which I have ever seen, is the affair which the Buckeye Engine Co. use, and which, by the way, they have attached to their engine at the Millers' Exhibition. It is simply a jet condenser, containing a simple air pump, driven by a belt from the engine shaft. The thing is perfectly self-contained, and can be set up on short order. My own opinion is, that it would be better and cheaper if made of No. 10 sheet iron, after the order of the Stillwell & Bierce heater, instead of the heavy and expensive, though elegant casting now used.

* * * * Very respectfully,

CHORDAL.



IMPROVED SHAPING MACHINE.

Improved Shaping Machine.

The shaping machine is a shop tool intermediate between the planer and the milling machine. By its use many pieces of machine work can be planed quicker than on an ordinary planer, with a consequent saving in time, and in the wear of tools required for finishing the work. The cut herewith represents an improved shaping machine or circular planer with a swivel vise, steel-faced jaws projecting outside to hold long or short work for planing it on ends, such as punches and rods. Work can be fastened as quickly as in the common vise at any angle, or the machine will plane any bevel. The tool bar is heavy and is worked by an easily adjusted crank pin and indexed slotted lever. It gives a slow motion for planing and a quick return. There is an adjustable center on the vise to raise and lower. It has an automatic brake to stop quickly. The bearings are large and long, and the machine will take a heavy cut. The large gears have extra large bearings to insure their wearing well. The vise is quickly replaced with face plate by one bolt. The cross slide stops automatically at each end. The machine is self-feeding, and can be kept at work with but little attention. By its use the work of planing circular dies, racks, key seats, cranks, and many other parts of machinery can be greatly facilitated. Face plate counter shaft and wrenches accompany every machine; circular mandrels and index centers with work-wheel are provided when required.

There are five sizes of these shapers made, having 8, 10, 15, 17 and 20 inch stroke, respectively, and planing from 14 to 28 inches wide. The manufacturers are E. Gould & Eberhardt, Newark, N. J.

Blacksmithing in Germany.

In the interior towns and villages of Germany, says the *Ironmonger*, it has been the custom for many years for the farmer to purchase the iron for his tires and horseshoes, and in some instances, when having a new wagon built, to purchase all the iron necessary for the same, the length of every piece being furnished him by the smith. One part of the contract is that the smith shall return to the farmer all cuttings from the iron, and it frequently occurs that the farmer remains at the shop until the iron is all cut up, in order that the smith shall not indulge in too much cabbage. The horseshoeing part is also a feature. The farmer will bring with him the end of some piece of iron or tire with which to make the shoes, or perhaps a dozen or more old horseshoes to be converted into new ones. The farmer must blow the bellows until the work is forged, and must then hold up the horse's foot while the shoes are being fitted or fastened, and invariably carries the old shoes home with him, unless he prefers to give the old shoes in payment for the apprentice's services in holding up the feet.

Ocean Telegraph Cables.

The telegraphic service between the United States and Europe, says *Engineering*, is in a satisfactory condition, but there is no good communication by wire between North and South America, or between the United States and Asia. Europe, on the other hand, has been wonderfully active in the extension of lines and cables to other continents. There are now two cables between France and Algiers; Cairo and Khartoum have been connected; a wire has been carried to Cabul; the Transvaal has been connected with Cape Town; and the latter place is now in connection with Europe, via Natal, Delagoa, Mozambique, Zanzibar, and Egypt. Another line has been established between Asterabad and Tiflis, through the whole of Persia, while Russia is extending its telegraphic network to Eastern Siberia. Much progress has been made in the domestic telegraphic system of Brazil, especially in the interior; a cable has been laid along a good part of the western coast of South America, and all the settled portions of Australia and New Zealand are now in active communication with one another as well as with Europe. A new cable connects Port Darwin, the northern terminus of the trans-continental line of Australia, with Java, Singapore, Malacca, and Penang. Several cables have been laid in the Baltic. The cables now required are one across the Pacific, two between the United States and Rio and Valparaiso, respectively, as well as minor cables to connect Cayenne, Colombia, New Caledonia, the Phillippine Islands and Chinese stations with the world's telegraphic system.

One of our foreign exchanges notes that a Workman's Industrial Exhibition is to be held in the Alexandra Palace some time in September, the full particulars of which, it is promised, will be shortly announced.

At the inquest on the twenty-five persons killed in the Walsall, England, boiler explosion, the engineer admitted, in cross-examination, having by mistake moved the weights in the safety valve lever five inches nearer the end the boiler insurance company had directed. Jonah Davey, C. E., for the company, estimated the pressure to have been 37 pounds per inch, or 7 pounds above the insurance company's limit.

Working Drawings of a Steam Engine. Sections of Bed Plate.

The accompanying illustrations represent working drawings of sections of bed plate for a 100 horse-power steam engine, by W. H. Hoffman. Working drawings of this bed plate complete were published in the AMERICAN MACHINIST for March 27, 1880. By comparing these drawings, the construction may be readily understood, and further description will be unnecessary.

Machines for Leather Working.

Among the latest inventions in the making of leather boots and shoes and collateral articles, says the *Shoe and Leather Reporter*, is the hydraulic shoe press, with which one operator can sole 700 pairs of shoes per day. Next comes the beating-out machine, which is a most necessary adjunct to a large shoe factory. Then come several designs in power machines for trimming and planing the edges of soles of shoes, each doing the work of three men, and better than by hand.

Next comes the sewing-welt, or turn machine, making a shoe as pliable and comfortable as one hand-sewed, and it is hard to detect any difference, one machine being capable of making 120 pairs per day. Again, there is produced a lasting machine, whose work is simply perfect and wonderful. Then we have a new welt shoe machine, or aid to hand sewing, which pricks the holes and trims the sole, ready for the workman to simply put in the stitches, making the boot or shoe a hand-sewed shoe in every essential particular. Then the numerous wax and dry thread sewing machines come in, adapted for every variety of work, from the finest French kid or velvet embroidered slipper, to the closing up of the seams of the heaviest stoga boot or brogan. Again, we have a patent vamp folding machine, which neatly and rapidly turns the edge of the vamp, leaving a neat and finished appearance instead of a raw edge; heel-scouring and sand-papering machines are made in every variety; stamping machines for monograms on the soles, heel trimmers, and an endless variety of small but useful machines; peg cutting and nail rasping machines, that will clean the pegs and nails out of a shoe from heel to toe, from a child's shoe to a heavy boot, leaving the inside perfectly smooth, which do not disturb the crimp or injure the upper in the least.

Then we have the boot and shoe crimping machine, two entirely separate inventions, the boot crimper being capable of perfectly crimping 12 to 16 cases of boots daily, and better than can be crimped by hand, and the shoe crimper that can finish in a perfect manner over 400 pairs per hour. In leather machinery we have glassing, stoning, pebbling and polishing jacks, tanning and stuffing mills; hide unhairing machines that will do the work of four to eight men, taking out the lime, doing away with the objectionable bating or drenching, and doing 800 sides daily with ease. Then we have the wonderful scouring or hide machine, that marvel of skill and ingenuity; union and belt knife splitting machines; bark mills, capable of grinding many cords of bark, wet or dry, daily; tan presses that will press perfectly one cord of bark per hour, and leave it so free from water that it can be immediately used for fuel; the wonderful leather measuring machine, for giving positive and instantaneous measurement of skins or leather. Then there is a new machine for softening leather, by which every fiber is loosened and softened without injury, leaving the leather strong, soft and flexible, besides hundreds of other machines which are now being perfected.

Somebody, who probably had nothing else to do, has figured out that from 75 cents' worth of iron ore may be made $5.50 worth of bar iron, $10 worth of horseshoes, $180 worth of table knives, $6,800 worth of fine needles, $29,480 worth of shirt buttons, $200,000 worth of watch springs, $400,000 worth of hair springs, or $2,500,000 worth of pallet arbors (used in watches.)

Pattern Making.—Building up Work.

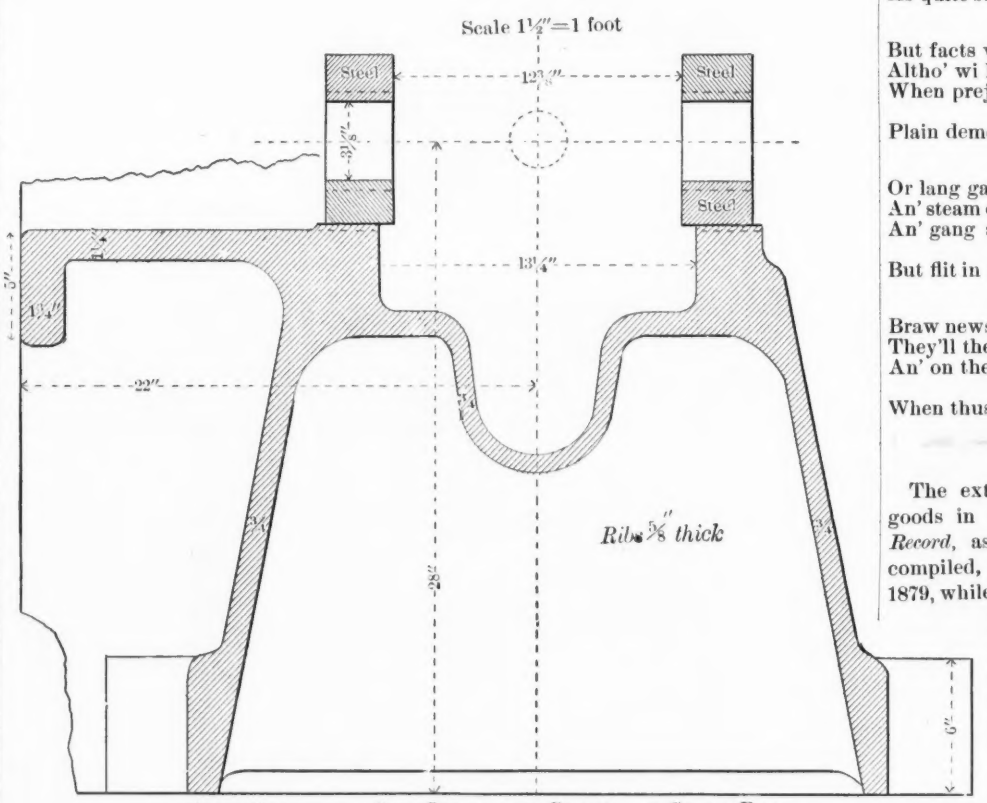
BY L. F. LYNE, M. E.

In deep patterns, as for instance packing rings, the shrinkage referred to in my last article on the above subject will cause depressions in the sides of the pattern, which will be a serious difficulty in drawing the patterns from the sand; it breaks up the mould, thereby causing much delay and annoyance to the moulder. The magnitude of this difficulty depends upon the extent to which the timber has been seasoned.

I have known very valuable patterns to destroy themselves through this cause alone. When badly-seasoned timber is being worked by a pattern maker, he finds that the pattern upon which he is at work is constantly changing its shape, therefore the interest that the workman should take in his work is greatly impaired; while, on the other hand, it is always a pleasure to work a piece of well-seasoned timber.

Much time and labor are wasted through the purchase of badly-seasoned timber.

Some people who carry on a large manufacturing business have an idea that there is a certain amount of economy in purchasing



CROSS SECTION OF BED PLATE AND CENTER OF GUIDE BARS.

thick timber for making patterns, as for instance plank 3″ thick of which to make patterns, which will require no building up. This is a false idea of economy, for the reason that in using large pieces there is a great waste of material. If thin stuff be used, strips may be worked up which could not otherwise be used, as in building up a cylinder pattern, the piece nearest the center is the widest, while each succeeding piece may be narrower until there is sufficient material to finish the circle required. In using thick material there must necessarily be a large amount wasted, as the pieces of which the cylinder is to be made are generally worked out square at the edges, and the surplus material is cut off afterwards. The foregoing directions, of course, refer to small cylinders and pipes, as large cylinders, for instance, 10″ and upwards, are generally lagged up.

For the benefit of the uninformed I would explain how to lag up a pattern for a large cylinder.

A pair of heads or ends are first made, which may be either in the shape of a semicircle or with any number of flat sides, as may be desired, the number of which is, of course, governed by the width and thickness of the material to be used. I prefer the former plan, as it is much less work to fit the lagging upon a rounding than upon a flat surface; besides, the joints may be made quicker and better.

By making the heads round, they may be turned up in a lathe, whereas if flat places were desired, they would each have to be laid out separately and planed. Considering the amount of extra work required, it is far preferable to make the heads round. I think it proper just here to say that wherever work can be accomplished in a lathe, as in fitting upon round surfaces, this plan ought always to be adopted, for the reason that the work may not only be done quicker, but far superior to any other way.

These advantages are frequently overlooked by even the best workmen, but by offering these suggestions through the AMERICAN MACHINIST, perhaps we may draw out the views of other men, and thus arrive at conclusions as to the best and most economical way to do the work of making patterns.

The Steam Barge, or Nautical Novelty.

[Written by WILLIAM MUIR, saddler in Kirkintilloch (Scotland), March, 1808, on seeing the newly invented Steamboat pass through the great Canal, dragging two vessels behind it, fully loaded.]

When first by labour Forth and Clyde
Were taught o'er Scotia's hills to ride
In a Canal, deep, lang, and wide,
Naebody thocht
That winders without win' or tide
Would e'er be wrocht.

To gar them true that boats would sail
Thro' fields o' Corn or beds o' Kail,
An' turn o'er Glens their rudder's tail,
Like weathercocks,
Was doctrine that wou'd needed bail
Wi' common folks.

They ca'd it nonsense, till at last,
They saw boats travel east and wast,
Wi' sails an' streamers at their mast,
Syne, without jeering,
They were convinced the blustering blast
Was worth the hearing.

For mony a year, wi' little clatter,
An' naething said about the matter,
The horses haul'd them through the water
Frae Forth to Clyde,
Or the reverse, wi' weary splatter,
And sweaty hide.

Then wi believed, poor silly bodies,
Wha naething ken o' learned studies,
That horses' hoofs and hempen woodies
Be't still to draw them,
An' cursing callins, clad in dudies,
To swear and ca' them.

But little think wi what's in noddles,
Whar science sits an' grapes an' gudles,
Syne darklins forth frae drumly puddles,
Brings things to view
That the weak penetration fuddles,
O' me an' you.

For lately we hae seen a lighter,
An' in her doup a fanners flighter,
May bid boat-haulers a' gae dight her
Black sooty vent.
Than ha'f a dozen horse she's wighter
By ten per cent.

Wi something that the learned ca' steam,
That drives at heughs the wa'-ken' beam
O' huge engines to draw coal seam
Or carry hutches,
She in her breast swells sic a feum,
As has few matches.

By it she through the water plashes,
An' out the stream behint her dashes,
At sic a rate baith frogs and fishes
Are forc'd to scud,
Like ducks and drakes amang the rashes,
To shun the mud.

When first I saw her in a tether
Draw twa sloops after ane anither,
Regardless o' the win' an' weather
Athwart her bearin'
I thought frae h—ll she had come hither
A privateering.

An' that the pair she had in tow
Were prizes struck me, sae I vow;
I cried, when fixèd to their prow
I saw her cable—
"In Satan's furnace now they'll low,
Amang the rabble."

It was sae odd to see her pulling,
An' win an' weather baith unwilling,
Yet d—l me care she onward sculling,
Defy'd them baith,
As constant as a mill that's fullin'
Gude English claith.

Can e'er, thought I, a flame o' reek,
Or boiling water's cauldron smeek,
Tho' it war keepit for a week,
Perform sic wonders,
As quite surprises maist the folks
O gazing hunders?

But facts wi' canna well dispute them,
Altho' wi little ken about them,
When prejudice inclines to doubt them,
Wi' a' her might,
Plain demonstration deep can root them,
An' set us right.

Or lang gae now, wi' whirligigs,
An' steam engines wi'll plough our rigs,
An' gang about on easy legs,
Wi' nought to pain us,
But flit in tethers, needless nags,
That us'd to hain us

Braw news indeed for man and beast,
They'll then hae nought to do, but rest,
An' on their former labors feast,
Wi' cheerful hearts,
When thus they see warm steam insist
To play their parts.

The extent of the production of woolen goods in this city, says the *Philadelphia Record*, as shown from statistics recently compiled, was 30,000,000 yards in the year 1879, while in 1880 it will be about 35,000,000 yards. Of all classes of textile fabrics the city's product is valued at $113,000,000. The silk mills number 51, with 14,250 silk spindles and 1,000 flax spindles. The cotton mills have 2,040 cotton cards and 499,286 spindles, and the woolen mills 795 wool cards, and 350,651 wool spindles The number of separate establishments is 504, occupying 1,040 buildings, and having 685 steam engines of 10,746 horse power.

The total products of all kinds average 2,756,400 yards monthly by hand looms, and 33,076,800 yards yearly by power looms of all kinds. About 250 hand looms are employed on Turkish or Smyrna carpets or rugs, and on Axminster and chenille.

Madison Square garden, in New York, has been sold for $80,000 to Barnum's Museum Company, a corporation just organized with a capital of $3,000,000 for the purpose of erecting the largest exhibition building in the world, to be opened early next year. William H. Vanderbilt makes a subscription of a quarter of a million to the enterprise, and is to be a director. P. T. Barnum and other capitalists will be largely interested. Barnum will also be President of the company.

In Belgium, it appears that all the women, and 73 per cent. of the men engaged in paper making, received in 1849, a daily wage of less than 30 cents, while 96 per cent. of the women earned less than 20 cents per day. The advance in the rates of wages paid in this industry in 1872 over 1849 was nearly or quite 100 per cent.

Practical Draughting.—Rounding off Corners—The Way to Make "Good Joints."

BY T. P. PEMBERTON.

One of the most useful problems, and one that is constantly employed by architectural and mechanical draughtsmen, on account of its simplicity and handiness, is the one given here. The object of its use is two-fold; one being to find the center of the quadrant which is to take the place of a right-angle, and another to ensure a good union between the straight and curved lines when "inking in."

Cases are constantly occurring where, for convenience or appearance sake, it is preferable to "round off the corners" in wood, stone, and iron work. Right-angles and sharp corners in cast-iron work are generally avoided as much as possible, and, therefore, in making construction drawings, the draughtsman can very frequently use this simple problem as one that will prove to be of great assistance to him in more ways than one. For instance, in drawing anything of a rectilineal form, if it should be thought best not to have square but to have curved corners, the first thing to decide upon is the amount of curvature, which, of course, in this case, has to be a quadrant, or arc of a circle, and, therefore, a regular curve having a fixed center and of definite radius. In determining the radii of corner curves, it is well to avoid the smaller fractions as much as possible. In most cases, $\frac{1}{4}''$, $\frac{1}{2}''$, $\frac{3}{4}''$, $1''$, $2''$, $2\frac{1}{4}''$, $2\frac{1}{2}''$, etc., will answer just as well as $\frac{5}{16}''$, $\frac{9}{16}''$, $1\frac{1}{16}''$, $1\frac{15}{16}''$, $2\frac{3}{16}''$.

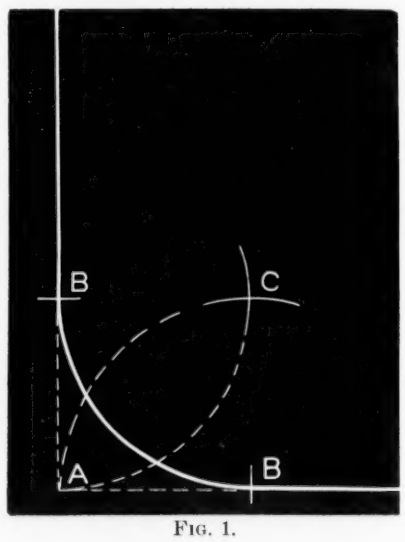


FIG. 1.

Fig. 1 illustrates just what we want to explain. Let *BA*, *AB*, represent the right-angle (square) corner of a cast-iron plate, a wooden table, a pedestal base, or any other object. We will suppose that a curved corner is desirable, and that the radius shall be $1''$. Take the pencil bows and open them to the extent of one inch. From *A* as a center, and radius (one inch) *AB*, mark off on horizontal and perpendicular lines at *B*, *B*. Without altering the opening of the compasses, from *B*, *B*, as centers, draw arcs intersecting at *C*. *C*, then becomes the center of the arc *B*, *B*, of 90°. *The center of the curve, therefore, has been found instantly, without trying or guessing.* Another thing has been done. When inking in (curves and circles, as a rule, always being inked in first), two points have been given where to terminate the extremities of the arc, viz., *B*, *B*; and consequently the straight lines can be drawn up boldly to *B*, *B*, and will make what are termed "good joints." Of course, this little "gem of a problem," as the writer terms it, is applicable to all four corners of the figure, or *wherever there is a right-angle.* A good joint is one where the junction of lines is imperceptible; the compound line (a right line and curve) must appear as if drawn at one stroke, and similarly where there is a union of two curves.

Among the desiderata in mechanical and architectural drawing, and largely (not always easily) acquired by draughtsmen, is the art of making good joints. A practical illustration of the curved corners and good joints is given in the annexed diagram, Fig. 2, representing the outline of a locomotive tender tank. The problem we have given is applicable wherever a curve is seen to occur in this. To secure a good ink joint where two regular curves meet, always draw a pencil line from the center of one curve to the center of the other. Where this line crosses, is the point of termination for both curves. In every case, draw a pencil line at the terminations of a curve, be it regular as the semi-circles and quadrants in the diagram given, or irregular as elliptical and parabolic ones exemplified in Grecian architecture. In the machinery constructed by the celebrated Whitworth & Co., of Manchester, Eng., graceful irregular curves enter into their designs far more than the combination of straight lines and arcs.

How Ought the Machine to be Made?

BY WILLIAM J. WILLIAMS.

It is sometimes worth as much to know how not to do something proposed, as it is to know how it should be done. It will be conceded by every one that to construct a machine, however simple, requires some previous thought. The more complicated

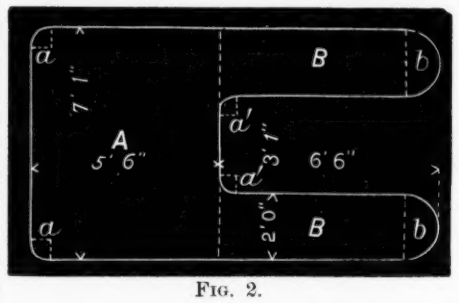
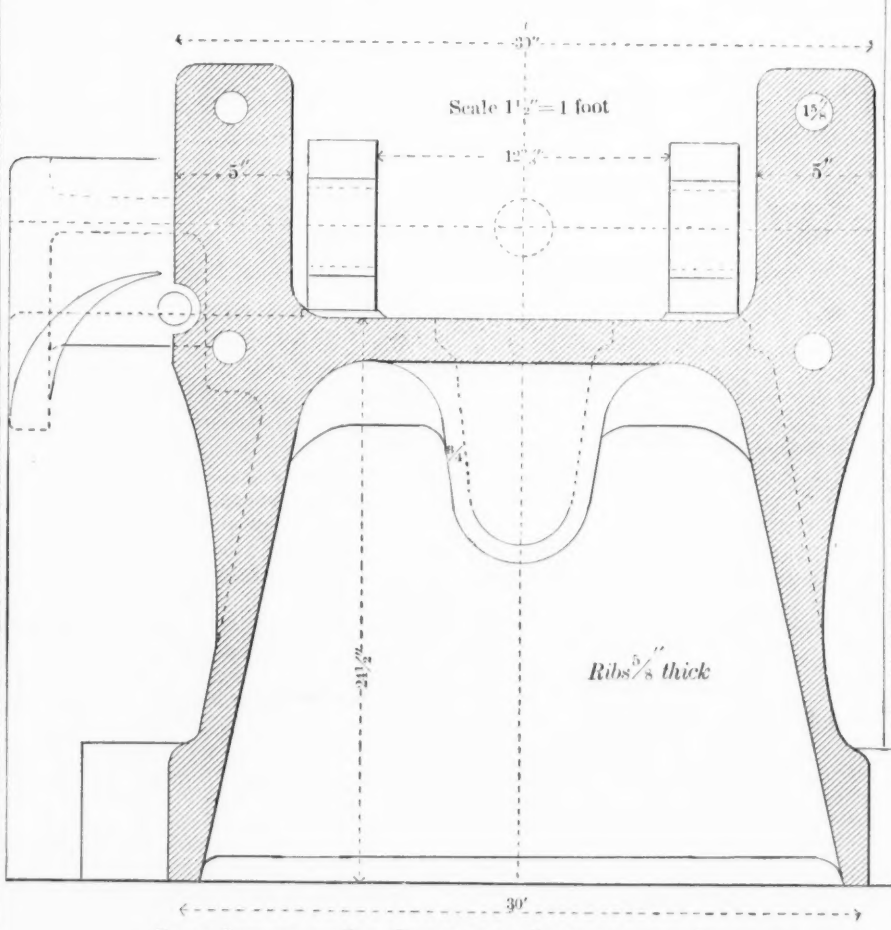


FIG. 2.

it is, the greater the mental task. The designer may have spent weeks, months, even years, perhaps, studying detail after detail, and panorama after panorama of the mechanical powers may pass through his brain; being scrutinized as they go by, to see if some new disposition of their parts cannot be made to suit his purpose. At last he has it complete, he thinks, and proceeds to create the creature of his brain. But it is not until his machine is at work performing the duty for which it was made that he can see where it can be improved. Its general principles may be correct, but its details, those little matters often so difficult to adjust, which mean perfect success to the inventor, satisfaction to the purchaser and pleasure to the operator, are not overcome until after repeated trial. In entirely new-formed machines where it is required to produce something either new, or to do it for the first time by mechanical means, short comings in details can readily be pardoned. Even a general failure under such circumstances might cause feelings of regret to all concerned. On the contrary, how much machinery that is not new in principle or design is erected year after year, by parties, who, judging from the fruits of their work, never give the subject the benefit of a second thought. They are called in and asked for their advice. The result is a pair of cog wheels here, a pulley there, a counter shaft, and a pair of wheels somewhere else, and a belt to set the whole in motion, and the thing is done. But upon making a trial to do what is intended it should do, it proves a complete failure. The manufacturer's money is gone, his time wasted, and perhaps ruin staring him in the face; or perhaps it does do in a manner what is wanted, but it takes more power than was ever anticipated, and he finds himself placed at a disadvantage with his competitors.

In these days of great competition the machine is best which will do its work well in the shortest possible space of time, and with the smallest expenditure of power. Therefore these points should never be lost sight of, no matter how trifling the object aimed at may seem to be. Any excess of power required causes an expenditure of fuel that should never have been required, for power, fuel and money are synonymous terms.

The following is an account of how a certain machine was erected, and indicates how it should not have been done, and its re-erection will point out how it might have been done in the first place. The power said to be required to perform the operation varied from $2\frac{1}{2}$ to 5 horse power, the latter quantity being requisite in the beginning, and diminishing gradually to the former at the completion of the operation. Whatever the power actually required, it was undertaken to be transferred from a main line of shaft making 72 revolutions per minute, on which was an 18 inch pulley. The power was conveyed to a counter shaft, on which were a 24 inch fast and loose driven pulleys, by a 7 inch single leather crossed belt. The shafts were nearly on the same plane, and their centers 19 feet apart. On one end of the counter shaft was a beveled toothed wheel of 23 teeth gearing into another on a vertical shaft of the machine having 46 teeth; pitch of teeth $1\frac{1}{2}$ inches and 4 inch faces. Judging from observation of the machine at work, the wheels were none too large in face or pitch for the duty required of them. In order to compel the belt to perform its office the ends had to be drawn together with clamps to such a degree of tension that when struck with the hand it sounded almost like a drum head. No work, as a paying manufacturing success, could be done with it. Great was the wonder that as before the advent of the new machine the engine had but little power to spare; now it was completely used up, so to speak.



CROSS SECTION OF BED PLATE NEAR JUNCTION WITH CYLINDER.

It was suggested that perhaps somehow or other the new machine had hold of the long end of the lever, vouchsafing only the short end to the engine. The hint was taken, and resulted in displacing the 18 inch pulley on main line shaft for one of 30 inches diameter, those on counter shaft from 24 to 22 inches, and bevel wheels exchanged for those of 17 teeth in small wheel and 68 in large one; face and pitch the same as self displaced. These changes made a slight reduction in speed of machine, which was admissible under the circumstances, rather than going to the expense of new patterns to maintain the original speed. The tables were completely turned, as previous to the alteration the machine punished the engine, but now the engine punished the machine (if the expression be allowed) in the shape of bent and broken parts. The wheels would not keep in gear as they should, resulting in broken teeth from springing of hangers. Head block of vertical shaft of machine was anything but a stationary object. The friction of the teeth of wheels was so great that fire would issue from them at certain points in every revolution of the machine.

In order to understand as far as possible, without the aid of a sketch, the greatest resisting parts, and hence all or most of the trouble, the following will assist the reader to find the cause. Effects are seen, but causes are not always understood. First, the object was to mix certain finely powdered minerals with certain liquids and make a dough-like mass, and unless it could be done with the least desirable amount of the liquid in a given time (and, it may be added, with the least expenditure of power) it could not possibly be a success as a paying business operation. The machine was composed of a vertical shaft revolving in a cylindrical vessel 36 inches diameter and 18 inches deep, having in the center of its bottom a step into which the shaft revolved.

On the lower end of the shaft was keyed a cast iron bar, a cross section of which represented a rectangular figure joined to an inclined plane, the bottom of plane being the cutting edge, which was propelled against the stock. Into this bar, on each side of the shaft, were set at right angles, a series of knife-shaped projections about 14 inches high. Across the top of the cylindrical vessel, was bolted a stationary cast iron bar, serving as a steady bearing for the shaft and also having a series of knives in it, between which the lower ones on the bar, which were keyed to shaft, revolved. Now, the places of greatest resistance were when the revolving bar with its knives passed between the stationary ones. All of them passed each other at the same time, which could have been avoided, had one arm of the bar on the end of shaft been at some angle, so that it would not have met its greatest point of resistance until the opposite arm had passed through its greatest opposition. It was evident, from watching the machine, that here was one of the chief causes why so much power was required to drive it. Secondly, a quantity of stock would be pressed between the bottom of the cylindrical vessel and the under side of the revolving bar, creating a frictional surface equal in length to the diameter of said vessel and width of bar, which was $4\frac{1}{2}$ inches. Again, as the stock directly over the bar, as is

moved in its path, was virtually raised from the bottom, an amount equal to its thickness ($1\frac{1}{2}$") was allowed to drop vertically back to the bottom of mixing vessel. Now, had the cross section of the revolving bar been that of a scalene triangle, with its apex cut off, the knives would be set in what would be the flat part. The stock, in falling, would have had a tendency to press the bar forward, thereby making use of its gravitation to assist the power drawn from the engine to complete the operation. Whether the above suggestions to improve the design would make it a successful machine or not, nothing but actual trial would discover. They are plausible, at least, and it was an undeniable fact that even after the recounted alterations, it could not be classed among the category of successful machines.

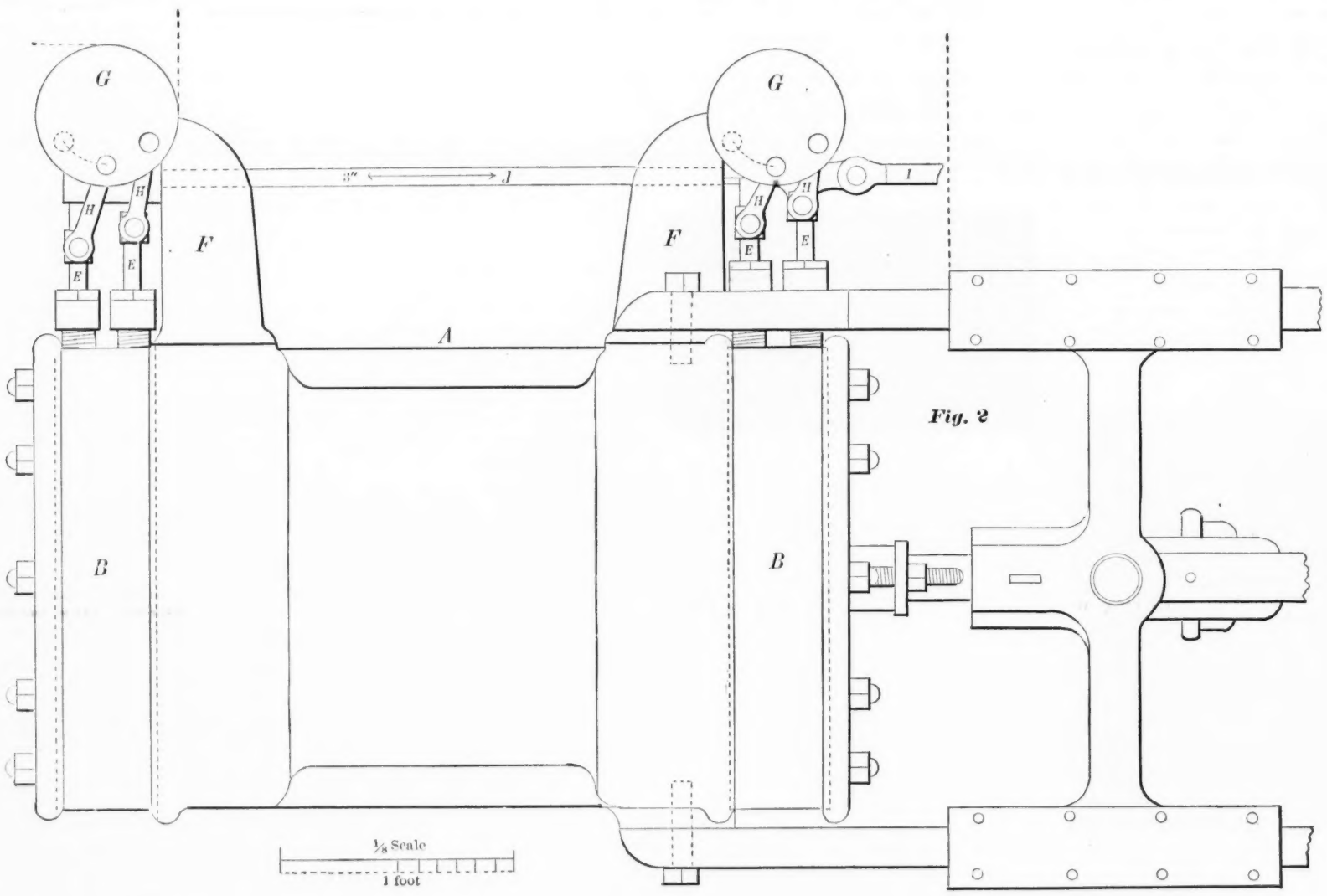


Fig. 2

Letters from Practical Men.

POINTS IN MECHANICAL DRAWING.

Editor American Machinist:

There are various points in mechanical drawing, with regard to which conventional agreements might be more strictly observed with a possible advantage. There is one, however, which, if not uniformly settled upon, may lead to error in workmanship and has caused positive loss of hundreds of dollars. This being the case, I feel justified in asking a little space for this article in your valuable paper. The point in question is as to the proper relative position of the three projections usually made of a given piece of machinery. Some draughtsmen are puzzled as to whether or not the plan should be placed above the front elevation, and the side elevation on that side of the plan, or front elevation on which it appears as an outline of either of the latter. There should be no doubt about this, and the sooner it is settled the better. With a great many this doubt arises from the fact, that while the relative positions of the projections used in mechanical drawing are those due to placing the object in the third angle, at most schools where descriptive geometry is taught, it is placed in the first angle. This may simplify the method of teaching, but is not suited for the reading of drawings by practical workmen; and it would be well to call the attention of all students of engineering to this while pursuing the study of descriptive geometry. The workman judges everything by his practical experience, and since he must place his eye at a higher point in order to look down on an object than he must when viewing the front of it, he expects to find in the drawing the plan placed above the front elevation.

In a like manner, to take a view of the side face of an object, he must move toward that side on which the face in question appeared as an outline of the front view, and expects to find the side elevation located accordingly in the draft. Possibly this will be better understood, if I illustrate it by a drawing similar to one of those which came under my notice. Suppose the drawing in Fig. 1, to represent a gridiron valve to be finished all over.

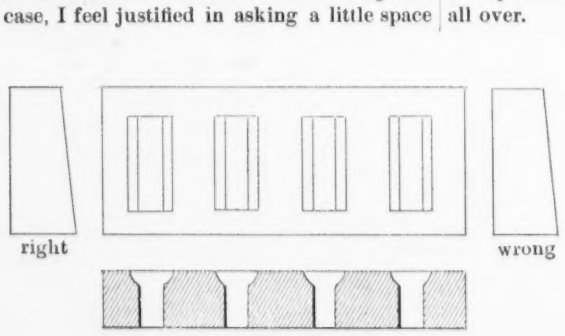


Fig. 1

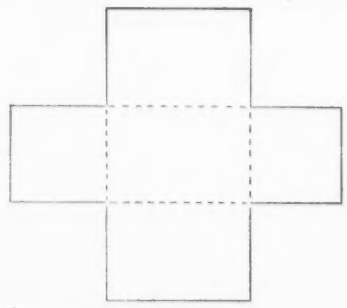


Fig. 2

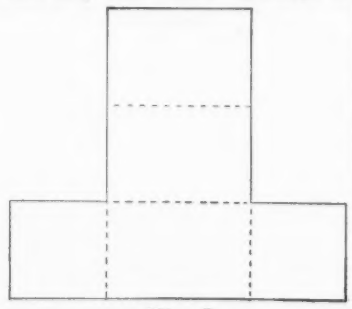


Fig. 3

It is evident that only one of the two side elevations can be the correct one. Here, then, is clearly shown the effect of relative position of projections. It may not be out of place to call attention to an error of this kind in the two page cut of the "Compound Engines of the S. S. Grecian" published in "*Engineering*", May 21st, 1880. This was probably done for convenience, and sometimes circumstances may suggest such a departure from the correct method. What has been said, also applies to the position of sectional views with reference to the projections. Before leaving this subject, I would suggest a practical way of insuring certainty as to the position of projections. Take a piece of card board, and cut it either in the shape shown in Fig. 2, or Fig. 3, and then fold it to the dotted lines, so as to form a box open on the lower side. Suppose this placed over the object to be drawn, and to be of glass. Then trace the views on each side of the box, just as seen through it. When the box is again unfolded, the projections will have the relative positions they should have on the drawing paper.

A. FALKMAN.

Philadelphia, June 19th, 1880.

PLAN OF A SOCIETY FOR YOUNG ENGINEERS.

Editor American Machinist:

Please accept thanks for noticing my communication about a society for young engineers. I would like to say further that your addition to it is very good, but not altogether in accordance with my ideas. The American Society of Mechanical Engineers is designed for men who have "been through the mill," and have learned the little things that help to make the draughtsman and engineer; moreover, they are men who are so situated that they can attend meetings in distant cities with less expense of time and money than those of whom I spoke. There is, no doubt, a necessity for some kind of organization before a new society can be started, but it could be very simple. How would this do: Let every person who is interested in this send his name and address to some person who is willing to start the thing, then that person will make a list which will be open for additions until, say, Sept. 1st. Then let the list be printed, and a copy sent to each one on the roll. On the first of every month following, if any new names are sent in, these are printed and added to the old list. In this way the names may be got together, and then let each one write to the address following his own on the list on any subject he pleases. For instance, Tom Jones may not like the way that he is compelled to calculate slide valves, through ignorance of a better way, and he writes out his difficulties and sends it to John Brown, who stands next on the list. John understands Auchincloss pretty well, and gives his opinion; and as John has some favorite theories on quarter boxes, he adds this and mails Tom Jones' epistle and his own to the next one on the list, which may be Henry Smith, and so on—the last man to the first again—until John Brown finds his communication, that he wrote some time before, among the papers which he gets from Tom Jones, who is before him on the list. He knows that his opinion on Auchincloss and quarter boxes has gone the entire round, and accordingly takes it out and writes his opinion on something else, which is suggested by some other man before him. The only expense of such correspondence would be the postage and printing of lists, and to start the arrangement, I will make the following offer to all honest, fair-minded young fellows, who are not afraid to impart that information to brother knights of the pencil and dividers, which may make our tasks lighter and ideas clearer in our chosen calling: that I will undertake the publication of the names, if any would like to try the plan as laid out, and are willing to bear the expense of starting in.

Yours truly, C. A. SELEY.

Box 2,575, St. Paul, Minn.

Editor American Machinist:

Every foreman knows and dreads the task he has before him on pay day in correcting real and fancied mistakes of the men under his charge, for they all pounce upon him at once the moment the cash is in their hands, and nine times out of ten find the mistake in their own figuring. To obviate this annoyance we have adopted the enclosed blank, and since that time pay day has no terrors for the foreman.

THE MILLER COMPANY, Dr.

Canton, Ohio, June 10, 1880.

To **JAMES WILLIS,** (NOT TRANSFERABLE.)

258 Hours Labor, @ 20c.	$51.60
Piece Work	18.30
Cr.	$69.90
By Cash paid May 20th	4.00
	$65.90

I certify the above to be the total amount of labor performed by me during the month of May, 1880, ending on the 31st.

Signed, JAMES WILLIS.

Keep Clean. Return for Correction before June 13.

To show its workings we will say our pay day is on the 15th, the pay roll is made out on the 1st., and the slips handed to the men who take them home and compare with their own time-book, and generally find them correct; if not, the foreman rectifies it and has a new one issued. The advantages of the slips are: It saves annoyance to the foreman and unnecessary trouble by their being handed in at different times, not all at once, but all are expected to be in and signed by the men at least two days before pay day.

Respectfully yours,
The Miller Company.

THAT TANGYE CHISEL.

Editor American Machinist:

The request of Chordal to those who have used the Tangye chisel "to speak up," I am glad to be able to respond to.

I have used the tool in the West Indies, and found it to be just what Chordal says it looks like, *i.e., wrong.*

In heavy work, such as chipping off boiler rivets, the blade or bit battered up so that it was impossible to remove it from the stock after an hour or two of use. There was a tendency to *spring away* from the work, which was very tiring to the left hand, the result being slow work. This tendency became less as the bit became shorter, but never entirely left it, even when the bit was but half an inch long, and then the swell of the stock obstructed the view. This swell was also in the way at times, as, for instance, in chipping a spur wheel, as one size of stock was too large to go between the teeth, and the next smaller had to be held at an uncomfortable angle in order to get at the base of the teeth.

I gave this chisel a fair trial from necessity, as I was where I could not obtain a bar of steel under a week's time, so had to use what was at hand. The bits would at times shake loose, but, even at best, I could not do a good day's work with it in ten hours. The balance of the tool is poor, or seems so, to one not used to it; and the result of using it was *slow work*, which I consider to be a fact that should keep it out of our tool chests.

W. D. FORBES.

The Multiple Port System of Valve Gear.

BY F. G. WOODWARD.

[In consequence of an error made by us we reproduce this article entire from our issue of June 26 with the cuts correctly represented.]

In the AMERICAN MACHINIST of March 20, page 4, Mr. Smith asks a very pertinent question relative to the many-port idea which was illustrated in the issue of Nov. 8.

No satisfactory answer can be given to the question, except by actual test upon a much larger scale than I have ever seen the system applied. The best arrangement of this system I have ever seen was upon a portable engine of about six horse-power. Of course such an engine is not of suitable size to test the question properly. In this case the valves are placed upon the ends of the cylinder, the valve chests serving also as cylinder heads. The accompanying sketch will illustrate its principle as applied to this portable engine. I have, however, drawn it to a scale suitable for a 16″ piston, so that any party may test the question upon an ample scale. The sketch was made for a locomotive, each cylinder being cast with half of the saddle *A*, Fig. 1. This figure shows the end plan of the cylinder, the inflowing steam entering the valve chest (*B*, Fig. 2), through the passages *m*, and the exhaust passing out at the passages *n*. Fig. 3 represents the outer plan of valve chest, showing the disposition of the inlet ports in the upper half, and the exhaust ports in the lower half. The inlet valve, Fig. 6, works in the upper half. Fig. 4 shows the inner plan of the valve chest, the exhaust valve, Fig. 7, working in the lower portion, of course. The construction and operation are so clearly shown that only a brief explanation is needed. The two standards *F*, which carry the rockers *G*, are screwed to the cylinder, the rockers being united and worked by the rod *J*, this rod being connected to the eccentric by the rod *I*. The rockers *G*, are connected to the valve stems E, by the links *H*. The manner of attaching the valve stems to the valves is clearly shown in Figs. 6 and 7. The inlet ports are just $\frac{1}{4}$″, and the exhaust ports just $\frac{1}{2}$″, and the lap of the valve just $\frac{1}{4}$″ The maximum travel of the inlet valves is $\frac{1}{2}$″, and that of the exhaust valves $\frac{3}{4}$″. The vibration of the rods *I* and *J* is 3″. Let the dimensions and explanation here given be strictly followed, and an excellent 16″ engine will be the result. Give the engine a single inlet and exhaust port at each end of the cylinder, instead of the many ports as here shown, and the travel of the inlet valves would need to be $1\frac{1}{4}$″, and that of the exhaust valves 2″, in order to secure the same area of port opening that the multiple system gives.

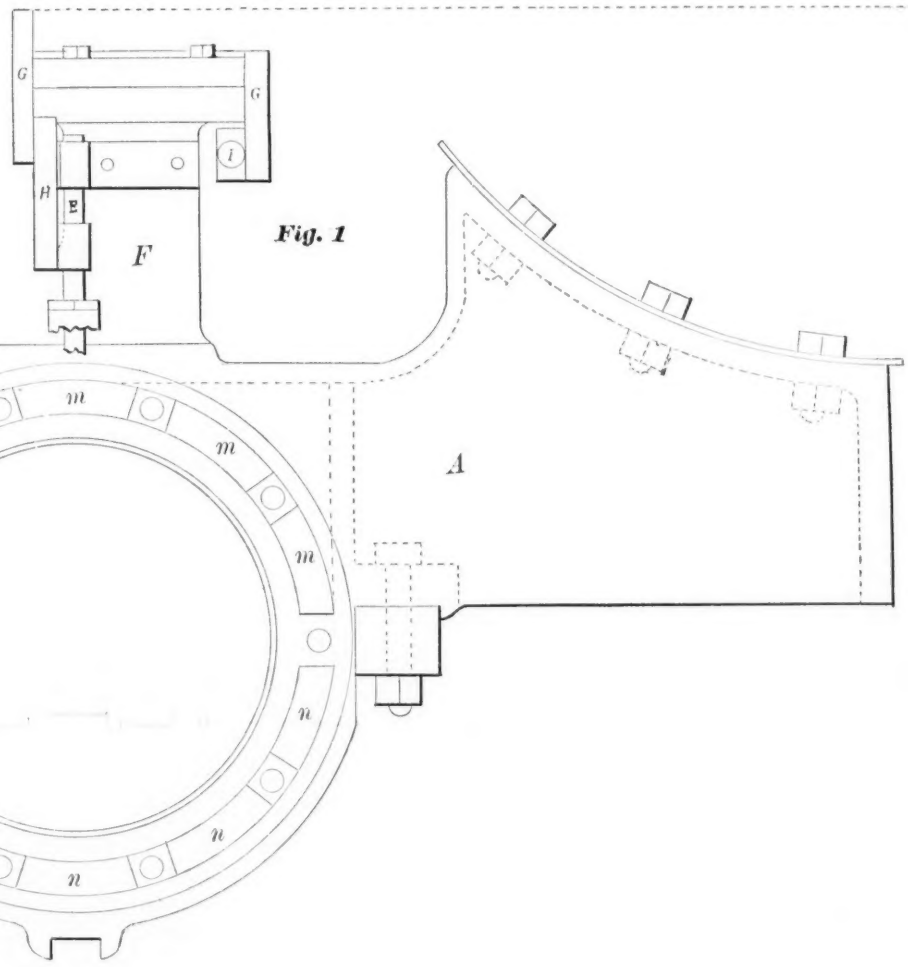


Fig. 1

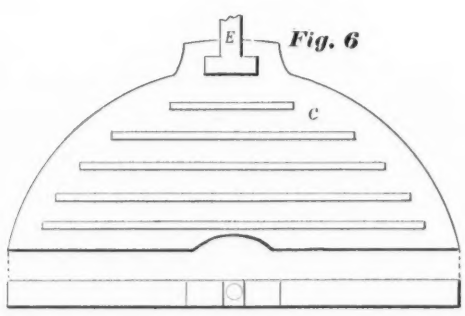


Fig. 6

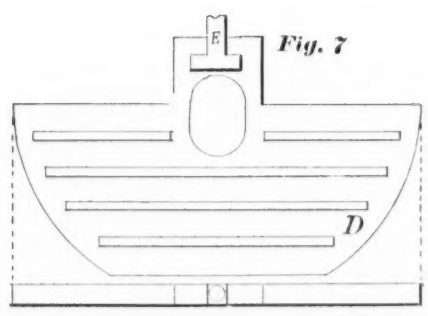


Fig. 7

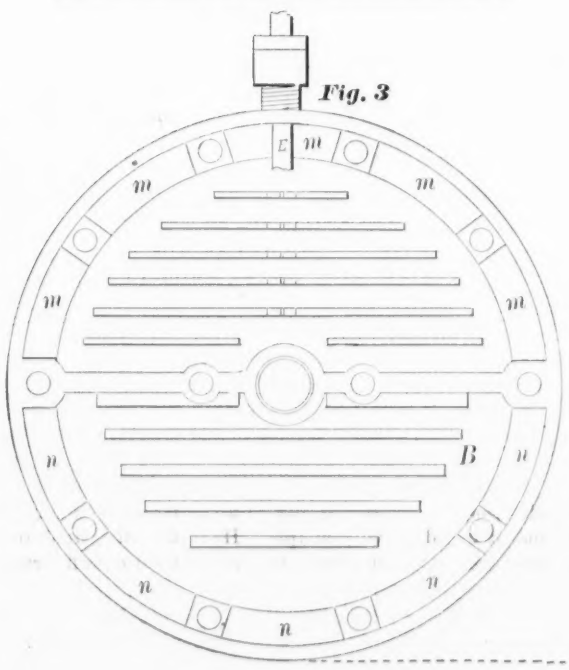


Fig. 3

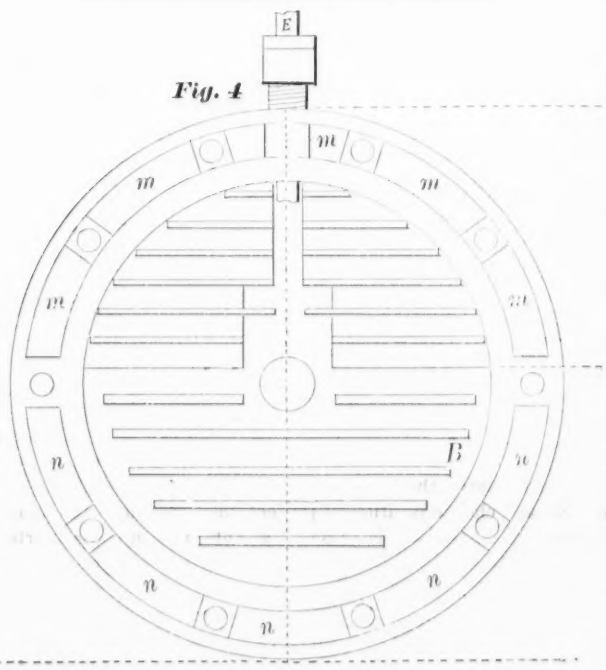


Fig. 4

It is stated that Professor J. E. Reynolds, of Dublin, has discovered a new process of coating metals without the use of the current. He exhibited some specimens at the Royal Dublin Society last week, and "plated" a brass tube and one of glass with a brilliant strongly-adhering film of galena, simply by immersing them in the solution. The cost of the process is said to be about one-eighth that of nickel-plating. Some articles have been exposed to the action of the atmosphere for several weeks without the deposit showing any sign of tarnish or rust. We understand that the process is protected by patents both at home and abroad.

THE SCOTCHMAN AND THE MINERALOGIST.—"Yon man gave me his bag to carry by a short cut across the hills to his inn, while he took the road. Eh! it was dreadfully heavy, and when I got out of his sight I determined to see what was in it, for I wondered at the unco weight of the thing; and man, it's no use for you to guess what was in that bag, for you'd ne'er find out. It was stones." "And did you carry it?" "Carry it! Man, do you think I was as mad as himself?" Nae! nae! I emptied them all out, but I filled the bag again from the pile near the house, and I gave him good measure for his money."

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NEW YORK, JULY 10, 1880.

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Shop Inconveniences.

A great deal of unnecessary work is done in some machine shops that could, with a little forethought, be easily dispensed with. We do not refer in this connection to those who fail to provide proper tools for doing work, as fully half the shops in the land could save time and labor by improving their stock of tools, but have set out to direct attention to some of the inconveniencies which are patiently endured, year after year, that a trifling expense would obviate. The farmer who drew all the water for his stock throughout a whole season in a leaky milk can attached to a rope, letting half the water escape before reaching the trough, has his counterpart in the machine-shop owner who, instead of providing a simple pulley or tackle block to be used over a lathe, will allow from two to six men to either lift or roll a heavy piece of iron or steel up over skids to get it into position to be operated upon. The pulley would cost but a trifle, but the time of four or five machinists used up in doing this useless labor, perhaps a hundred times a year, represents a respectable outlay.

Some shop owners are too careless to place ring bolts in the ceiling of their work-room from which to suspend tackles for lifting heavy articles, or to assist in erecting heavy machinery, thereby requiring the expenditure of unnecessary time and labor every day. A good device for this purpose is a tripod made of three full length pieces of 1½ inch iron pipe. One end of each piece should have a sharp point projecting so as to prevent slipping on the floor. The top end of each piece should have a hole drilled through it and a piece of iron inserted to fasten the three together. A railroad suspended from the ceiling, provided with a traveling crane, is an arrangement that would save a prodigious amount of lifting and tugging in many shops where nothing of the kind is in use.

Chains may be found in almost any shop which are very inconvenient for the purposes intended, as the hook in one end is too large and ill shaped, and the other end destitute of a ring. Such chains are used by wrapping one end around the object required to move and tying a square knot. If the workman don't know how to tie a square knot the chain is likely to slip and make mischief in the shop. The chain, for convenience, should be about six feet long for ordinary work with a ring in one end and a hook in the other, made of square iron bent cornerwise, and of such a size as to easily admit a link. By means of the hook the chain may be shortened to any desired point.

We know of one instance where a single die stock with its set of dies, answered for three machine shops, and a round house on the same railroad. The shops are fifty or sixty miles apart, and the tools have to travel considerably in the course of a year. If the dies are in one shop and the stock in the other, often when it is required to cut a thread on a bolt, the dies are clamped in a vise with the bolt betweeen them, and the thread cut "by main strength and stupidity." We won't give the name of the railroad, for if we did, some manufacturer of stocks and dies would try to get their order and would surely be disappointed, for they are already supplied with all they can see any need for.

In moving heavy bodies about the floors of shops, complete sets of skids and rollers are desirable, but in many shops the skids are of irregular thicknesses and the rollers of varying diameters, thus causing, when used indiscrimately, an excessive exertion of physical strength, where there should be no need of it. Machinists will often spend more valuable time in looking around to borrow a tool than the tool itself is worth, rather than spend the money to buy one. Some shop owners are so economical that they always buy the cheap grades of steel, rather than pay the price of good tool steel for chipping chisels and the like. In consequence of this economy, they are obliged to spend more time in putting chisels and other tools in order than it takes to do the work required of them.

In some shops the floors are wavy and broken, causing the machinery to keep springing out of line, causing acute vexation. This could be obviated by putting in a new floor, but it is often endured year after year with a high degree of patience and philosophy. We know of one shop with a main line of shafting about 75 feet long, and two to two-and-a-quarter inches diameter, of which scarcely a foot is of a uniform diameter. It is full of grooves made by the ends of set screws in overloaded pulleys. The effect of this grooving has been to make the shaft crooked so that it will not run true. The hangers vibrate so much that the bearings are rapidly worn away. It is impossible to get a pulley to fit upon such a shaft, and there is a heavy loss of power through unnecessary friction. The cost of repairs, extra power, and extra lubrication in this shop would buy a new line of good shafting in a very short time.

The location of machines in some shops is such that in changing work from one to another it has to be transported over the floor to a considerable distance, in some cases up stairs or down cellar. A little re-arrangement would do away with such needless inconveniences. If time is money, whatever tends to absorb our time unnecessarily is a waste of money, the amount of loss being just as much as we could earn in the time needlessly absorbed.

Electricity as a Motive Power.

The employment of electricity as a motive power on as large a scale as propelling tramway cars for passengers has been proved feasible both in Europe and America, but whether it can be done economically enough to make it a commercial success is a question open to serious doubts. Where it is undesirable to use steam motors for a tramway, and horses are excluded (as upon elevated roads), compressed air has been found to work admirably and with fair economy. The apparatus need not be cumbersome even if one charging of air is required to run ten or twelve miles. With a well designed and constructed engine, the loss of power is very small, as air is perfectly elastic. The most successful trials thus far show that with electricity a much higher percentage of power is lost, besides which, it would doubtless be more difficult and expensive to keep the electrical machinery in working order, than that running by compressed air. In transmitting power to a distance by electricity, there would necessarily be involved a large outlay for good conductors and a considerable loss of power before reaching the point for applying it to useful work. Some experiments in France have demonstrated that plowing can be done by electricity, but the possibility of its doing this work as economically as steam seems very remote. As electricity is not a prime motor, it must depend upon steam, water, wind, gas, or some other force for its generation. It is evident that there would be greater economy in applying power directly to work, than in converting it from one form into another before its useful application. It is believed by those who have given the most diligent study to the subject, that the possibilities in the way of electricity are far beyond anything heretofore attempted by its aid, but for purposes of ordinary motive power it does not appear to be well adapted.

An international exhibition is to be held at Manchester, England, in the coming autumn, under the auspices of the Industrial Exhibition Company, Limited. At present it is proposed to keep the exhibition open for six weeks or two months. The exhibits will be divided into several sections, and almost anything of interest will be admitted, save agricultural machinery and implements, which will be admitted to a special agricultural show subsequently. Section A will include all kinds of machinery and motive power (with the above exception) and the machines will be shown in motion, producing the articles for which they were designed. The other sections will comprise textile manufactures, mineral products, carriages, firearms and their appurtenances, appliances for saving life and property, domestic appliances, sanitary appliances, art and education.

The Master Car Builders' Convention.

We continue our notes from last issue:

Reports were submitted on the best diameter for cast iron and steel-tired car wheels. One report stated that up to the present time one road had placed 198 42 inch wheels under their cars. Of these 2 were Allen paper steel tire, 8 Washburn steel tire, and the remainder cast iron chilled wheels. Of the 198 wheels, 86 chilled wheels had been removed, leaving 112 wheels still in service. Their use dated back to August, 1877. A few of the 86 removed were taken out on account of broken tread, or flange, or bad tread, resulting from defects in manufacture. Of the remainder, one was removed on account of worn or sharp flange; three were worn flat, and the others were removed on account of worn tread. Sixty of the wheels removed made an average mileage of 67,571 miles. One pair made 122,773 miles, another 95,509 miles, and another 95,328 miles. The others made all the way from 90,000 to 50,000 miles. The performance of 42 inch chilled wheels had so far been a disappointment to them. They had expected an average of 100,000 miles.

In order to be profitable, comparing their first cost with that of 33 inch chilled wheels they must make that mileage. In other respects, however, the 42 inch wheels had proved satisfactory, and there were undisputed advantages in connection with large wheels that would go far to off-set an adverse result in wheel service by effecting a saving in car surface and maintenance as well as engine service. The use of 42 inch wheels as compared with 33 inch would show a saving of about 27 per cent. in the ordinary wear of journals and bearings, and a like saving in the actual running expense of oil and waste. In the draft of trains, especially in starting, a considerable difference had been shown in favor of the 42 inch wheel. As the 42 inch wheel made only 70 revolutions per minute, while the 33 inch wheel made 100, there would, of course, be less friction for the former to overcome between the journal and the bearing, and the increased leverage of the larger wheel would aid materially in overcoming it. It was believed that the large sized wheel could better overcome the slight obstructions due to imperfections in the track. The mileage of the Washburn wheel had not yet been obtained, but it was thought that the 42 inch Allen steel tire paper wheel the safest, easiest riding and most economical wheel that could be used under passenger stock. The use of the 42 inch was endorsed instead of the 33 inch wheel under passenger cars, but in respect to freight cars it was doubtful whether the increased cost of the wheels would not be counterbalanced by the advantages arising from their use.

It was further reported, referring to 393, 42 or 43 inch wrought iron, steel-tired wheels upon another road, that none had been re-tired, and only two had failed, one having a fractured tire at 196,150 miles, and the other a defective weld in the hub at 112,300 miles. The average mileage of the wheels to date was 67,215. Those wheels were manufactured under the Mansell patent, the object of which was to provide a safe fastening for the tire, and one wheel ran for six months with the tire fractured without the slightest danger, and was only removed when the flange at the point of fracture showed signs of giving way. There were also ten wheels of another make having cast iron centers and steel tires fastened on by a different process, none of which had failed Their average mileage to date was 91,098. With the 42 inch wheel hot boxes were unknown.

Some did not altogether favor the 42 inch wheel. Through it a saving could undoubtedly be effected in the general wear and in the brasses and oil, and also in the wear of the wheel. But Professor Dudley had

shown by experiments made on the Boston and Albany road, that while on a level track a saving of about 4 to 5 per cent. would result from the use of the larger wheel, on a grade there would be a loss of power with the larger wheel. These results were objected to by some.

It was asserted that the 42 inch wheels on one road were Washburn steel tire spoke wheels. Two-thirds of them had to be changed, but th s course was attributed to improper annealing. An experimental 33 inch wheel was made of some new amalgamation, which, from its record up to the present time, it was expected would make a mileage of 800,000 miles.

On another road a set of 42 inch wheels had been fitted up which were put under a passenger coach, and the riding of the car was unsatisfactory. The wheels were taken from the axles, a mandril was turned and pushed through the bore of the wheel, and the wheel rolled upon the mandril on planed ways, the same as a mechanic would turn a pulley for a line shaft. It was found that some wheels required 13 pounds to balance them. It would be impossible to make a car ride well with wheels so much out of true as those were. The majority were, however, in favor of the 42 inch wheels.

The previous recommendation of the Master Car Builders' Association that the break shaft should be placed on the left side of freight cars as you face it from the track, was confirmed, and it was also agreed to recommend the placing of the ladders in the same position on all cars, and the same to be embodied in a circular to be addressed to the different railroads of the United States and Canada.

The subject of track gauges was then discussed, during which it was stated on information that some roads had made their track gauge 4 feet 8¾ inches, instead of 4 feet 8½ inches, and that the difference in the length of gauges for sitting wheels varied something like one inch. It was thought necessary that there should be a standard gauge for sitting wheels for the standard gauge of roads in the country.

A committee was then appointed to communicate with the different railroads of the country with a view to securing the universal adoption of a standard gauge for sitting wheels.

Some were of the opinion that such an effort would be ineffectual. On a road that has many curves, there needs to be more lateral motion between the wheels and rails than on a straight road.

One gentleman claimed that he can run four to five cars more in a train by having a large amount of play between the wheels and rails than he can with a tight gauge. Perhaps it would be well enough to fix a gauge, but it would be necessary to change the opinion of the general managers on the subject before it could be brought into general use.

Several of the members stated that they were caused much trouble by the refusal of certain roads—notably the Pennsylvania, the gauge of which is larger than ordinary—to receive their cars on account of the difference in gauge.

It was stated that the Lake Shore had changed their wheel gauge at the request of their chief engineer, who discovered that the wheels could stand more than the rails, and that his department was called upon to make a great many repairs on account of tight running wheels. Another gentleman said that the gauge on his road was 4 feet 8 inches, but a great deal of trouble was caused on account of hot boxes, and hard pulling of the train, and so they changed the gauge to 4 feet 7¾ inches. Complying with the request of some of the other roads they added to the tread of the wheel outside one-half inch, making it about half way between a narrow and a broad tread wheel. It was also argued that it would be difficult for the car builders to establish a standard gauge that would fit tracks of 4ft. 10in., 4ft. 8½in., and 4ft. 8¼in.

Attention was called to the fact that the old iron rail was rounded at the sides in such a way as to fit the corner formed by the flange and the tread of the wheel, while the new steel rail, with its flat top and sharp corners, did not fit the flange in the same way.

It was agreed that a committee of master car builders should be appointed to confer with a committee of civil engineers with a view to bringing about the adoption of a standard gauge for wheels and tracks.

It was the judgment of the association that ¼ of an inch play between rail and flange, had been demonstrated to be the most economical.

The following question was proposed and discussed: "What is the best material for brake shoes?" This led to an animated discussion. An exhaustive report was presented embodying the results of a series of tests made, which had demonstrated the superior durability of the Congdon shoe. The superiority of this shoe was, however, warmly contested by one gentleman whose experiments made last year had convinced him of the superior abrasive power of the cast iron shoe. This he held was the important point. He had no doubt that a shoe made of case hardened steel would *last* longest, but in retarding power it would certainly be inferior to one of a softer metal. The shoe that would stop a train the quickest was the real desideratum, not the shoe which would last the longest.

Another gentleman said that in the year 1879 his road saved $5,000 in metal by using the Congdon instead of the cast iron shoe, which up to that time had been used by them.

The following question was then proposed and discussed: "What has been the experience of members during the past year in the repairs of cars with the continuous draw-bar?"

It was generally thought that the principle of the continuous draw-bar was a good one, and the trouble in connection with it was due to bad workmanship. If more attention was given to the cotter-holes it would be a step in the right direction. We are pulling, as it were, from the rear end of the car. If a draw-bar is divided into loops, a better effect is produced. A certain amount of slack is thus obtained, but that is perhaps rather a disadvantage than otherwise, as it multiplies the key-holes, and those key-holes are a source of trouble. The principle of the action of the draw-bar is very much prejudiced by the defective way in which they have been manufactured.

The cotter-holes should be made rounded at the ends instead of square. Several gentlemen considered continuous draw-bars a nuisance. They were constantly getting bent and it was necessary to hitch on an engine to draw them out when they needed repairs.

Another gentleman stated that during the last six months but two continuous draw-bars had to be repaired in the shops of his road, although his repairer had 30 cars passing through his hands daily. Cars were much better handled with the continuous draw-bar. He should be glad if all the cars equipped with continuous draw-bars were sent over his line.

The majority seemed to approve of the continuous draw-bar, notwithstanding the trouble of repairing it in case of accident.

After agreeing to meet next year in New York, the Convention adjourned.

An Elevated Electric Railway for Berlin.

The Berlin Council of Magistrates has had under consideration a proposal, submitted by Messrs. Siemens and Halske, for the construction of an electric railway across a portion of the German capital. According to the proposal there will be two lines of rails, one for the up and another for the down journey. The lines will be carried on iron pillars 14 ft. 9 in. high, and nearly 33 ft. apart. These pillars will be placed along the edge of the footpath, so as to cause the least possible interference with the ordinary traffic. The carrriages will be narrow and short, containing ten sitting places and four standing places. The electro-dynamic machine, which will propel the carriages, will be placed under the floor of the carriage between the wheels, and a steam engine of 60 horse power, which will be employed in the production of the electricity, will be placed at the terminus. The stoppages will be very few, and the rate of speed will be, it is expected, about 20 miles an hour. The chief object of the undertaking is to convey persons quickly across the city, and especially to facilitate access to the city line of railway. The chief objection raised is that the carriages will pass along at the level of the first floor of the houses in the streets which the line will traverse, and it is feared this will lead to a depreciation of property. The magistrates have appointed a special commission of engineers and architects to examine into and report upon the proposal.

The New England Manufacturers' and Mechanics' Institute of Boston have voted to call the first assessment of 10 per cent. on the capital stock. Land on Huntington Avenue has been leased for twenty years, with privilege of ten years at $5,000 per year, with privilege of purchase. The finances of the Institute are: land, all secured; no debts; and $100,000, the whole capital stock, free, to be devoted to building.

Questions and Answers.

Under this head we propose to answer questions sent us, pertaining to our specialty, correctly and according to common sense methods.

(1.) J. T. Reading, Penn., writes: We have a duplex boiler of 160 horse-power which we do not use in summer. Do you think it will be best to keep about four gauges of water in it rather than let it stand dry? Some boiler makers say it will not do the boiler any good to keep it full of water when not in use. Please advise us what course to pursue. A.—A boiler when abandoned for a season should always be emptied as there is less danger of injury to the iron, the extent of which depends upon the chemical composition of the water contained in it.

A good plan to prevent the inside surface of a boiler from rusting when not in use is as follows: Let the water out when the boiler is hot so that the inside may be thoroughly dried, after which put into the boiler four or five gallons, depending upon the size of boiler, of crude petroleum, then fill the boiler gradually with water. The petroleum will float upon the surface of the water thus penetrating all parts of the boiler. After the water reaches the top it should be let out. An examination will then show that the interior of the boiler has received a coating which will effectually prevent the action of salt air, or rust.

(2.) C. D. A., Fond du Lac, Wis., writes: I wish you would give me some means of finding the length of eccentric rods or valve rods on locomotives, or other engines using link motions, also method of setting the valves of such engines. I have never seen such directions in print. A.—To find the length of eccentric rods upon a locomotive or other engine where a link motion is used: Place the large part or "belly" of the eccentrics directly above or below the shaft or axle, so that lines drawn through the center of both would coincide. Hang the links and place the reversing lever in the center of quadrant; place the upper part of the rock arm exactly at right angles to the valve seat; place the link so that the center line of the pin holes for eccentric rods may also be in line with the center of lower part of the rock arm. Now measure the distance accurately from the center of pin holes in the links to the center of the shaft, and deduct one-half the diameter of eccentric, also the length of foot upon eccentric strap measuring from the face of bearing to face of foot. This will give the length of eccentric rods. Where there are no feet upon the eccentric straps it is better to place the straps upon the eccentrics, and measure to the point where the rod is to be fastened, allowing for any alterations, as shortening or lengthening. For instructions how to set the valves on a locomotive, or other engines using a link motion, read a practical article on the subject by L. F. Lyne, contained in our issue for Nov. 1878. There you will also find other necessary information.

(3.) L. B. Damascus, Pa., asks: Can you give me the rule to construct cone pulleys of unequal diameters, so that the same belt will answer for the different changes of speed? A.—A rule for the construction of cone pulleys was given in our issue for Nov. 15th, 1879, answer to question 3. We also refer you to an article on the Application and Power of Belts, by V. Hook, which appeared in the AMERICAN MACHINIST, Jan. 24, 1880.

(4) A. R., Lewiston, Maine, asks: Can you inform me as to the best cheap coating to put upon an article of spring wire which is liable to be occasionally wet with hot water? *A.*—Your query is very indefinite, as you do not state for what purpose the article is to be used. If it is a finished article we would advise you to get it nickel plated, but if unfinished, a mixture of lime and oil will be sufficient. If the article is not to be used as a spring, a coating of shellac will do very well.

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American Watch Tool Co., Waltham, Mass., Whitcomb Watch Makers' Lathes, and Watch Machinery.

W. D. Skidmore. Machinery designed and executed and superintended if desired. Patent Office drawings. Hours 9 to 6. No. 733 Broadway, N. Y.

Dixon's Traction Belt Grease. Dixon's Founders' Perfect Wash. Dixon's Plumbago Foundry Facing. Dixon's Graphite Machine Grease. Dixon's Everlasting Graphite Axle Grease. Dixon's Dry American Graphite Perfect Lubricator. Send for explanatory circular to Dixon Crucible Co., Jersey City, N. J.

Dies for every purpose. Stiles & Parker Press Co., Middletown, Conn.

Wilkinson & Crowell, 1201 Beach St., Philadelphia, make an Improved Metallic Piston Rod Packing, which is entirely automatic and of great durability. Works well at high or low pressure, and can be used in common stuffing box, or without any stuffing box at all.

See Standard Turbine advertisement in last issue.

Norris & Rutter, Mechanical Draughtsmen and Patent Solicitors, 424 Walnut Street, Philadelphia.

To Manufacturers and others: We are prepared to build all kinds of machinery. Patent Articles a Specialty. Correspondence Invited. Mather & Newitt, Practical Machinists, Leominster, Mass.

W. Barnet Le Van, Mechanical and Consulting Engineer, 3607 Baring Street, Philadelphia, Pa.

John Douglass, common and fine patterns made to order, also car wheels, working models, and experimental machinery. Shop at Washburn, Hunts and Co. Wheel Foundry, cor. Warren and Bay Sts., Jersey City, N. J.

Engines Indicated—Power Measured. W. H. Odell, Box 274, Yonkers, N. Y.

Second-hand 80 H. P. Tubular Boiler for sale cheap; also one large Blower. David W. Pond, Worcester, Mass.

Sheet Metal Presses. Ferracute Co., Bridgeton, N.J.

Manual of Power for Machines, Shafts, and Belts, with the History of Cotton Manufacture in the United States, by Samuel Webber, C. E., copyrighted 1879. Only work of the kind extant; 240 pages. Price $3. Address, D. Appleton & Co., New York, or the author, Manchester, N. H.

MANUFACTURES.

The Kiser Air Company, of Urbana, O., has been incorporated for applying air as a motor. Capital $100,000.

The Barney Skate Factory at Springfield, Mass., is being enlarged. The new part will be 189 feet on Water Street, with a wing about 100 feet on Broad Street, and the whole three stories high, to be built of brick.

Mr. Norman, the water contractor for Atlantic City, proposes to provide a complete water system with a guarantee to furnish all the water that may be needed from the mainland, with a system of hydrants for fire purposes, in return for a fifty years' monopoly. There seems to be a very general feeling toward accepting the propositions.

The Ferracute Machine Co., Bridgeton, N. J., manufacture a full line of plain power, power and foot presses, dies, spinning lathes and all canmakers' tools. They have lately issued a handsome 48 page catalogue describing their tools in full, and have established an agency at No. 20 Cliff St., New York.

The Gibbs Canton Plow Company, Canton, O., has been incorporated by M. L. Gibbs and others. Capital stock, $10,000, in shares of $100.

The Martins Ferry, O., Manufacturing and Building Company, has been incorported by Thomas H. Greed and others.

The Whitin Machine Company of Whitinsville, Mass., have contracted for one hundred tons of loom arches, and a large amount of card-cylinder castings. The total number of men employed in the machine works at present is 740.

Wilmington, Will Co., Ill., has in process of erection a factory for the manufacture of table and pocket cutlery, which will employ fifty men.

The P. C. Cheney Co., Manchester, N. H., are erecting a new building, 210×48 feet, which will be occupied by a rag engine and pulp and paper machines. They are enlarging their water power.

Estabrook & Wires have made a large addition to their clinching screw factory at Milford, Mass , for the purpose of manufacturing machines for driving the screws.

It is stated that W. R. Morris contemplates the erection of a glucose factory at Fort Ann, New York.

The Knowles Steam Pump Works at Warren, Mass., are rushing business with 150 workmen.

Thirty-thousand dollars have been subscribed toward establishing a stove foundry at a point between Saugatuck and Westport, Conn.

The Fitchburg (Mass.) Steam Engine Co. are running their shops 22 hours a day. They employ 60 hands and are full of orders for steam engines.

The new emery-wheel company at Northampton, Mass., are to make a specialty of corundum wheels. C. E. Stevens has been chosen manager of the works.

The Albemarle Slate Company has been organized in Boston, for the quarrying, manufacture and sale of slate, with a capital of $100,000.

The Annawan Mill at Fall River, Mass., which has heretofore been run by water power, is about to put in a steam engine of 200 H.P.

There is a project on foot to organize and build a 10,000 spindle cotton mill in Bath, Me. No doubt this city possesses many advantages for the location of such an industry. The city numbers many capitalists among her residents, and the enterprise would not be likely to fall through for lack of funds. Altogether the feeling is a strong one that a cotton mill will ere long be an actuality.

The Sibley Cotton Mill at Augusta, Ga., has organized with an authorized capital of $1,000,000. The amount subscribed is $600,000. The erection of a factory will proceed at once. This will be one of the largest factories in the South.

The firm of Ware & Ballou has recently been formed in Worcester, Mass. They are about to bring out a new emery and corundum-wheel called the "Gem." It is made in a mould without baking or pressing, and hardens ready for use inside of 24 hours. The wheels are said to be more uniform and reliable than those pressed or baked, and are not affected by moisture. Mr. E. R. Ware, of this firm, has had large experience in the emery wheel business.

The Maine Beet Sugar Company now occupy the buildings of the Forest City sugar refinery on West Commercial Street, Portland, in addition to their own buidings. The total cost of the buildings and machinery used exceeds $200,000. The refinery buildings are brick, while those of the company are wood, covered with corrugated iron. The factory was in constant operation for seventy-five days last winter, and the quantity of beets used for the season was 9,000 tons, of which 8,000 tons were raised in Maine. These beets were the products of contracts for 1,100 acres, showing an average of less than nine tons per acre. In some cases as high as thirty tons were raised to the acre. The company paid for 2,240 pounds of unwashed beets $5 at the railroad stations, and $6 delivered at the factory. The proportion of raw sugar obtained was seven per cent. of the weight of the trimmed and washed beets, and in addition there was three per cent. more of molasses. The sugar sold at the prices ranging from 6⅝ cents to 9⅜ cents per pound, and the molasses at twenty cents per gallon. The sales of sugar, molasses, pulp and lime waste amounted to $111,000. The total expenses exceeded $108,000.—*Boston Commercial Bulletin.*

P. Jewell & Sons, Hartford, Conn., have just finished a main belt for Wallace & Sons, of Ansonia, Conn., which is seventy feet long, thirty inches wide, and over three-quarters of an inch in thickness, there being three thicknesses of the best leather used in its manufacture.

Pond's machine shop at the corner of Union and Central Streets, Worcester, is undergoing some quite extensive alterations, and a 120 horse-power boiler has been put in.

The McKay Sewing Machine Association contemplate building an addition to their present extensive works at Lawrence, Mass.

The Sandusky, O., Rolling Mill and Manufacturing Company have reopened the old Nes Silicon Steel Works of that city, which have been leased for eight years.

We were in error in a recent issue in stating that Mr. William Wright had taken a contract for a new pumping engine for Yonkers. The contract has not yet been awarded. The city has had one of Wright's pumping engines in use for four years with the highest success.

Benjamin & Allen, West Waterville, Me., are building a new iron foundry.

A new glucose factory is about to be started at Ithaca, N. Y. $500,000 have been subscribed. One hundred men will find employment.

New York capitalists are looking to the establishment of a patent wrench factory at Littleton, N. H.

The Co-operative Stove Company of Troy, N. Y., are to build an addition to their works capable of accommodating thirty workmen.

Cummings & Gray have started a brass foundry and manufactory of fire hydrants and stop valves in Cincinnati. Mr. G. A. Gray was formerly of the Niles Tool Works.

The Enterprise Machine Works of Philadelphia, have opened their new manufactory and begun the manufacture of a gas consumer for use in puddling and heating furnaces.

L. Hardy & Co., manufacturers of machine cutters at New Worcester, Mass., have just completed a new shop 100×45 feet, which they are now moving into. The new shop is provided with a 50 horse power engine and a boiler of like capacity, is roomy and well lighted, and is a pleasing indication of prosperity.

Machinists' and Engineers' Supplies.

NEW YORK, June 24th, 1880.

Trade is good for hot weather, but as "taking stock" is going on in many supply stores, there is less attention given to outside trade. Prices are without material variation. A new twist drill, for the manufacture of which extensive preparations have been made, will shortly be placed upon the market.

James Beggs & Co., 8 Dey street, New York, have just issued a finely printed and illustrated quarto catalogue and price list of railway, mine and machinists' supplies. It contains 188 pages, and its contents is systematically arranged. Its neat artistic typographical appearance reflects great credit upon the printer, Mr. J. W. Pratt, 75 Fulton street. In this respect it is unsurpassed by any catalogue that has come to our desk. There is a convenient index which makes it handy for reference. The introduction begins as follows: "In presenting our new illustrated catalogue to our patrons, we deem it not out of place to invite their confidence for the reason of our long experience in the manufacture of many of the articles therein illustrated, together with a practical mechanical experience in the workshop in all its branches for more than 24 years. We also conduct our engineering department in the most careful manner, and are prepared to make plans and specifications for any of the branches in which we have been practically trained."

Peter A. Frasse & Co., 95 Fulton street, New York, are about to prepare a full illustrated catalogue of machinists' and jewelers' tools and supplies.

Iron Review.

NEW YORK, June 24, 1880.

The pig iron market is at odds and ends with a tendency to stronger prices. Outside lots are occasionally offered at lower than current rates, but there is more demand, and a feeling that bottom has been reached. Scotch pig, which has been selling at lower prices than domestic, has taken an upward start, Eglinton having advanced $1 a ton within two weeks, and other brands showing a firmer holding. We quote No. 1, $23 to $24. No. 2, $21 to $22, Eglinton, $20; Coltness, $23.50; Glengarnock, Summerlee and Gartscherrie, $21.50 to $22. Old rails are offered at $24, and wrought scrap at $23 to $24 a ton.

There is a feeling that manufactured iron at present prices is good property to hold. Prices can not recede much more, and are likely to either advance in the near future or to be well sustained at present figures.

Prices of iron seem to have got down about the cost of production, even taking into account the low cost of raw material.

Pierson & Co., 24 Broadway, N. Y., under date of June 24, 1880, quote prices out of store as follows: Iron Rails, $50 to $57, according to weight; Fish Plates, 2¾c. per lb.; Railway Spikes, 3c.; Bolts and Nuts, 3½c.; Common Bar Iron, 2.4c., basis from store; Refined do. 2.6c., basis; Ulster, 3.6-10c. basis; Machinery Steel, 6½c.; Best Tool Steel, 13½c.; Norway Bar Iron, 6¼c.; Norway Shapes, 6¾c; Nail Rods, 6¾c.; Sheet Iron, 3½c., basis; Angle Iron, 3¼c.; Tee Iron, 3¾c.; Band Iron, 3.4c.; Hoop Iron, 3.6c., and up according to size; Horse Shoe Iron, 3.3c.; Hot Polished Shafting in lengths, 2 ft. and longer, 9 to 10½c., according to size; Small Black Rivets, 30% off in papers; 10% off in bulk.

Carmichael & Emmens, 130 Cedar St., New York, quote prices of Boiler Makers' Supplies as follows: Flange, 5c.; C. H. No. 1 Shell, 4c.; Tank, 3¼c.; C. No. 1, 3¾c.; Boiler Tubes, 50% discount from list.

Metal Review.

LUCIUS HART & CO., 8 & 10 Burling Slip, New York, furnish us the following, under date of June 17th, 1880:

The advance in Pig Tin continues—market fairly active and prices hardening. London quotes: Straits Tin £83.10; Singapore, $26½; stocks light. In this market buyers are eager, but sellers hold off. Would quote Banca Tin, scarce, 21½c. to 22c.; Malacca and Straits, 18½c. to 19c.; Australian, Billiton and English Refined, 18¼c to 18½c.; Lamb and Flag 19½c.; Pig Lead 5c. to 5¼c.; Antimony, Cookson, 19c.; Hallett, 17c. to 17½c.; Domestic Spelter, 5½c.; Silesian, 6c.; Ingot Copper 19¼ to 19½c.; Nickel, $1.35; No. 1 Solder 10½c.; "half-and-half" 12½c.

WANTED.

Wanted, experienced machinists—steady work—good pay. David W. Pond, Worcester, Mass.

Wanted.—A situation as Supt. or Foreman of a foundry or machine Shop by a man of experience; a draughtsman and a thorough mechanic. No objection to south or west. Address Mechanic, box 1338, Boston P. O., Mass.

Wanted.—First class second-hand Pulley Lathe, swing 5½ to 6 feet, turn 4 feet. Send cost and maker's name to Lock Box 2151, Denver, Col.

Wanted by a skillful and intelligent young machinist, a situation with parties who desire the services of such an one abroad. Address J. L., care of AMERICAN MACHINIST, 96 Fulton St., New York,

An experienced machinery iron works Superintendent wishes to engage with reliable parties. Address, P. H. L. care AMERICAN MACHINIST office.

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WORKSHOP RECEIPTS
For the use of manufacturers, mechanics and scientific amateurs.
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Crown, 8vo, illustrated. Price, $2.00. Send for Catalogue of books for practical engineers.
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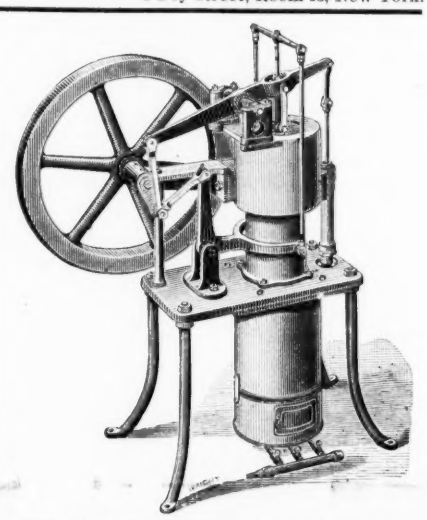
A handy and useful book of practical information for **Engineers, Machinists, Draughtsmen and Mechanics,** containing useful and reliable recipes, rules, processes, methods, practical hints, &c. **NO** medical or cookery recipes. 164 pages. This book will be sent, post-paid, on receipt of Twelve 3-cent postage stamps.
T. P. PEMBERTON,
5 Dey Street, Room 13, New York.

FOR SALE.
A Works completely equipped for the manufacturing of carriage axles; is well located in relation to Coal and Iron, also very accessible to market. Address
E. P. BULLARD,
14 Dey Street, New York.

Mechanical Books.
Send 10 cents for 96 page Catalogue of Books for Machinists and Engineers.
D. VAN NOSTRAND,
23 Murray & 27 Warren Sts., New York.

Drawing Instruments
AND MATERIAL, PAPER, &C.
G. S. WOOLMAN,
116 Fulton Street, New York.
Fully priced and illustrated Catalogues.



ERICSSON'S NEW PATENT CALORIC PUMPING ENGINE is specially intended for domestic use in lifting and forcing water from wells and cisterns, or from Croton pipes, to tanks on upper floors of buildings in city or country.
This pumping engine is entirely safe, no steam being employed, and is not liable to derangement.
All kinds of fuel will answer for this engine, but coal-gas is preferable, the consumption being only 15 cubic feet per hour. Besides gas is handier and cleaner than coal or other combustibles. Servant girl can operate it!
Price for 8-inch cylinder, pumping 350 gallons per hour 50 feet: With gas furnace, - $280 00
With coal furnace, - 275 00
Price for 6-inch cylinder, pumping 200 gallons per hour 50 feet: With gas furnace, - $210 00
With coal furnace, - 220 00
Manufactured by the Delamater Iron Works.
C. H. DELAMATER & CO., Proprietors,
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FRICTION CLUTCH PULLEYS AND CUT-OFF COUPLINGS,
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HALL'S PATENT
Compound Lever Cutting Nippers.
Every pair Warranted to Cut Steel Wire.
Worn or Damaged Parts can be replaced at a trifling cost.
Manufactured ENTIRELY OF STEEL by
THE INTERCHANGEABLE TOOL COMPANY,
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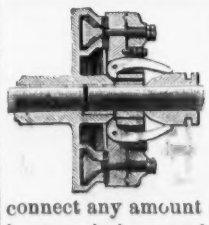
For sale by all dealers in Machinists' Tools and Hardware. Send for Price List.



Hoisting Engines & Elevators Safe, Durable and Reasonable in Price.
Friction Clutch Pulleys and Cut-off Couplings.
We manufacture the "Giant Friction Clutch Pulley," known as the "Captain." Is the Best in the World for connecting the gearing of callender rolls, hoisting coal, logs or freight. Our Clutch can connect any amount of power, at any speed, without slacking the motive power in the least, and gives no shock, is easy to ship and unship, in *fact*, this is the only Clutch that can do heavy work satisfactorily. D. FRISBIE & CO., New Haven, Conn.

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File Brushes, File Cards.
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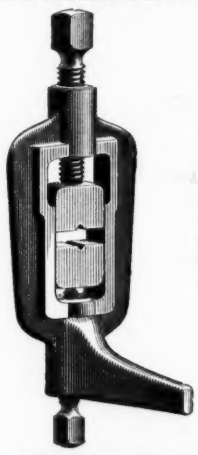
Have a Steel Frame, with two screws, so as to throw the center of Die the same distance from tail of Dog on a small piece as on a large. The Dies are hardened, and a good job with Hardened Steel Screws. Extra Dies can easily be fitted to suit any special work, or will be furnished as below:



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No. 1,	$1.25	½ Inch.
" 2,	1.00	¾ "
" 3,	2.00	1 "
" 0, Amateurs or for f't lathes	1.25	¾ "

When ordering Extra Dies please state which you require, the V or Tongued.

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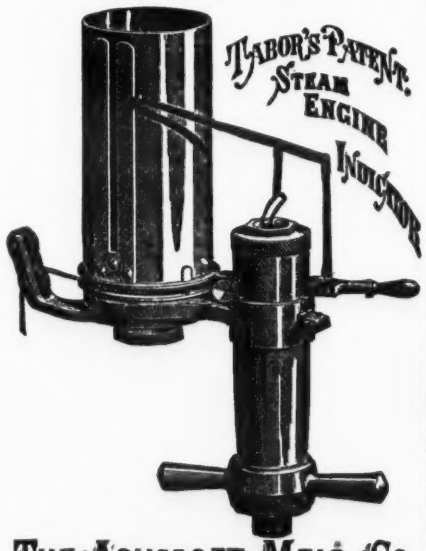

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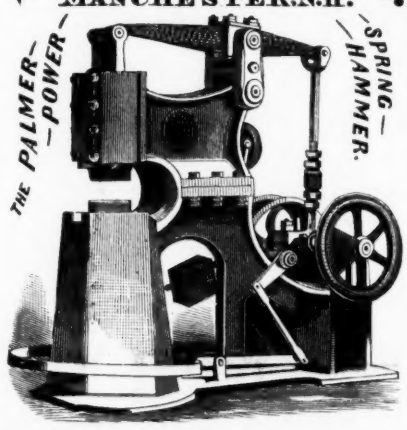

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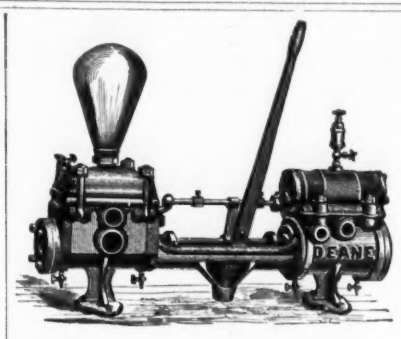

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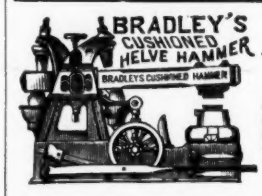

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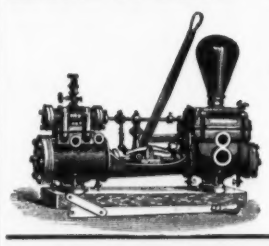

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Messrs. KEARNEY & FOOT, Brooklyn, N. Y., May 24th, 1877.

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Yours truly, G. E. TAFT, Sup't.

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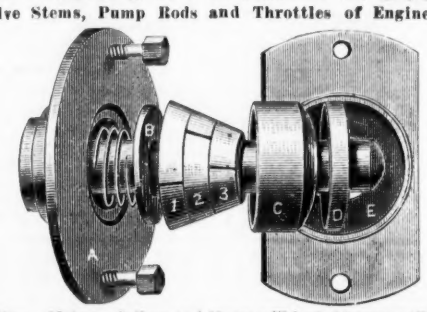

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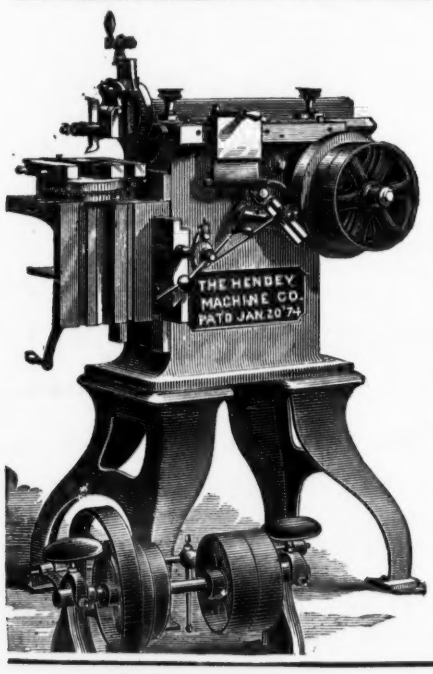

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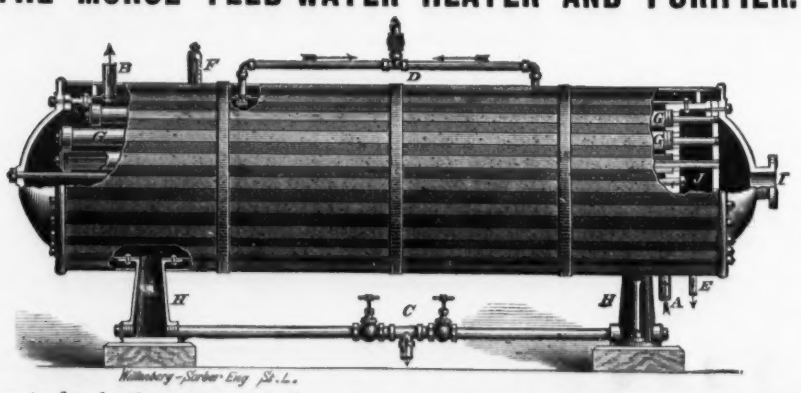

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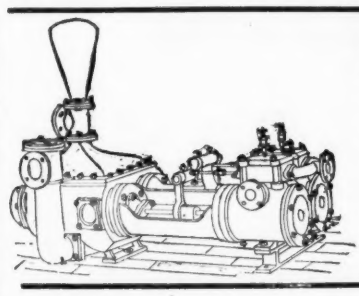

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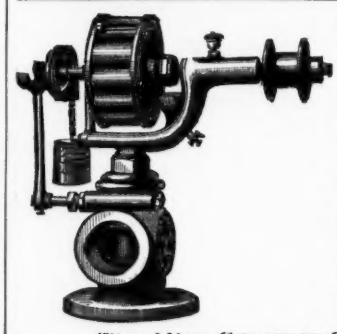

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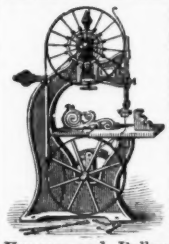

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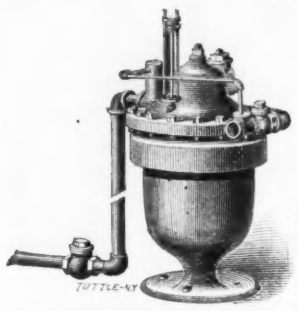

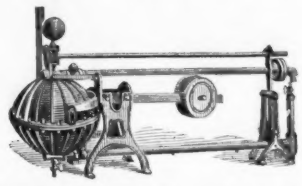

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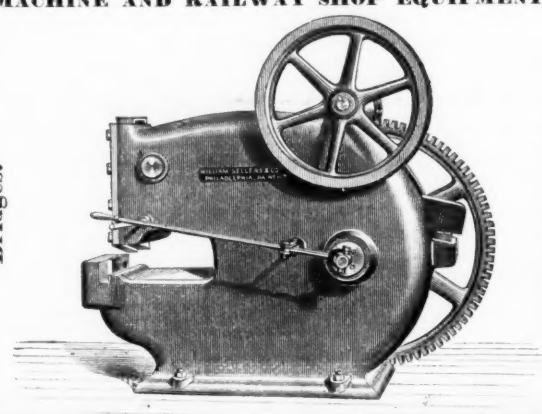

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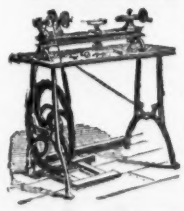

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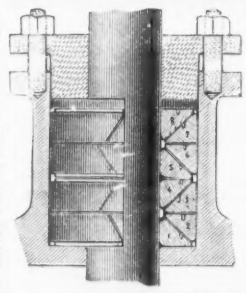

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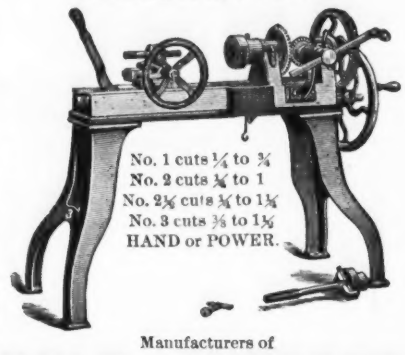

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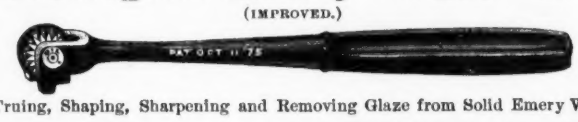

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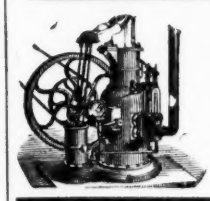

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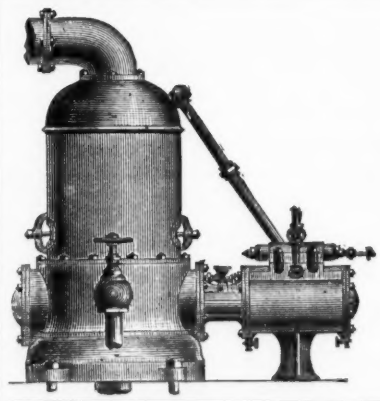

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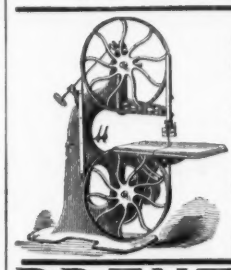

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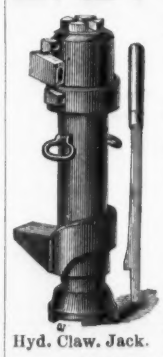

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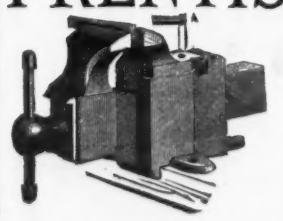

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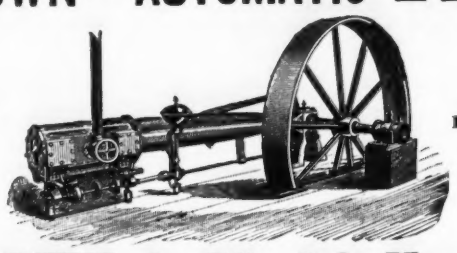

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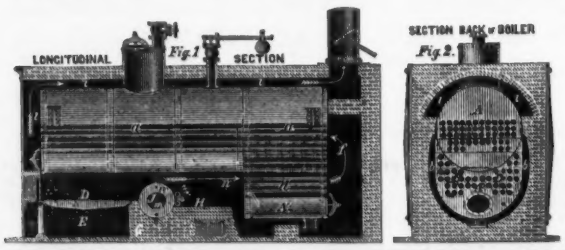

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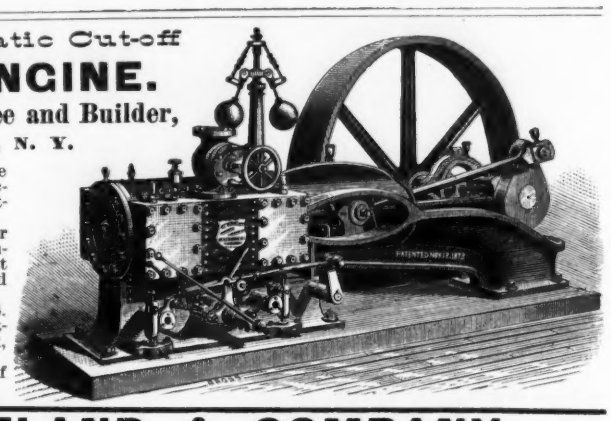

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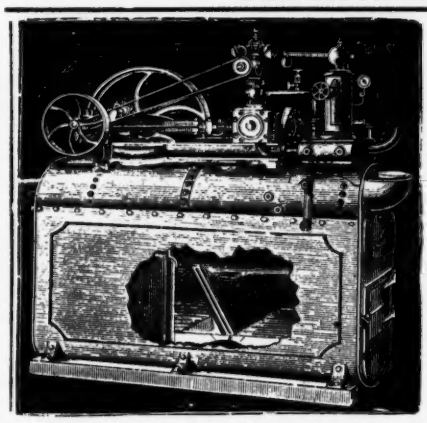

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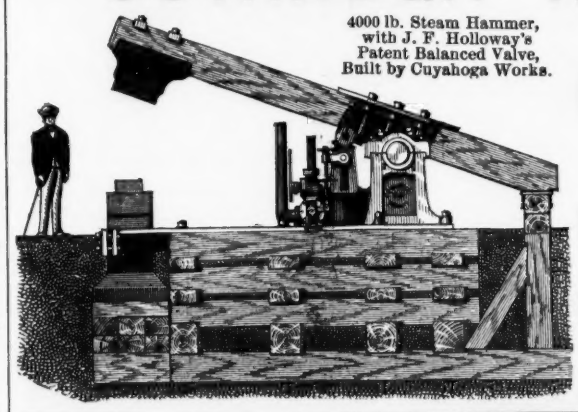

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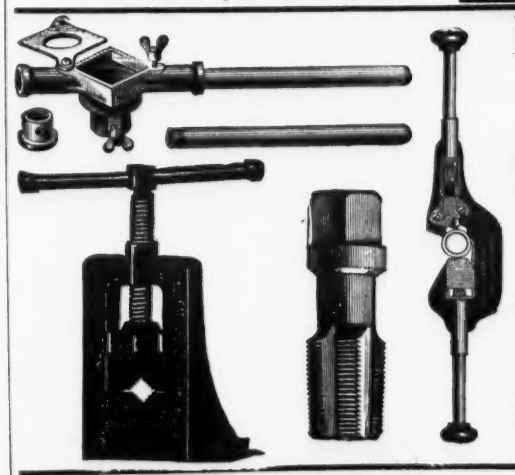

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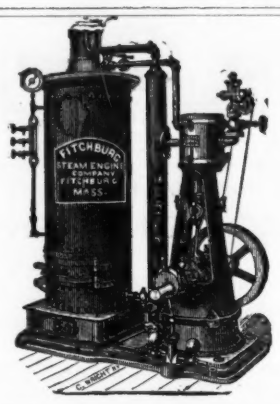

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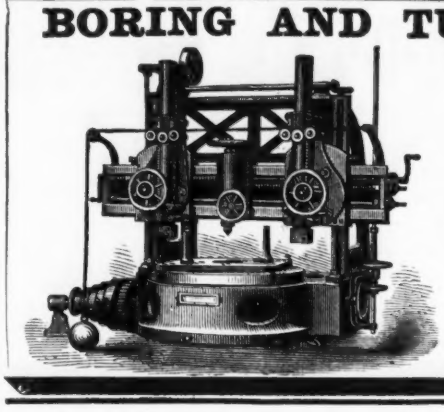

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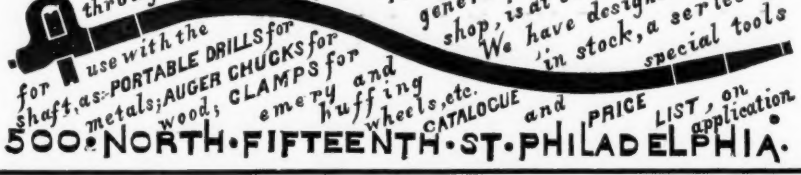
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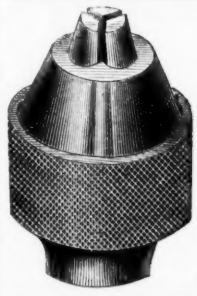

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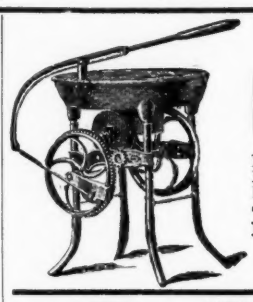

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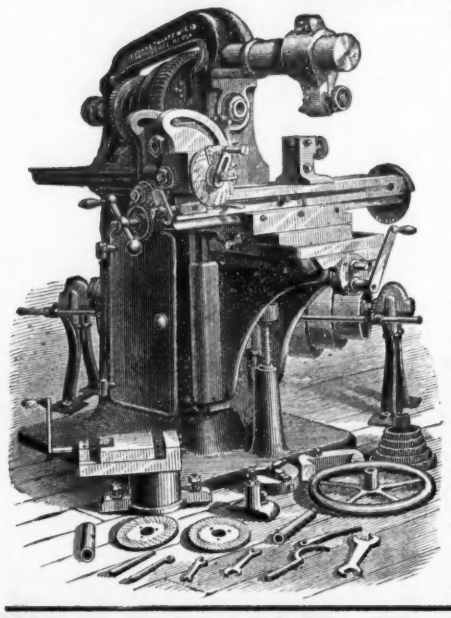

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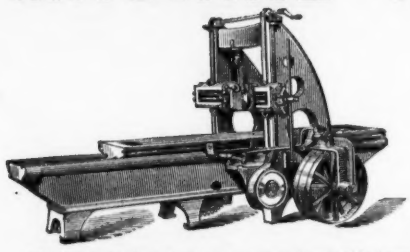

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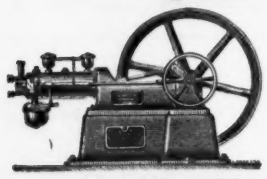

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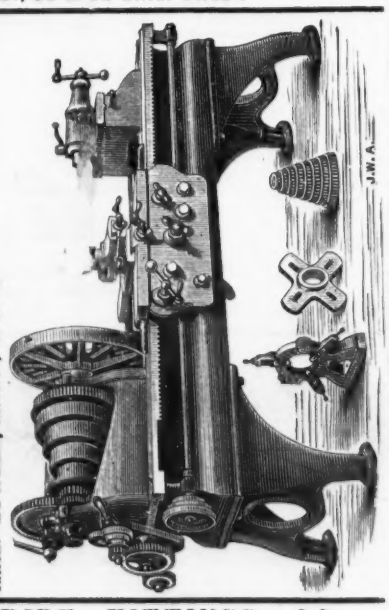

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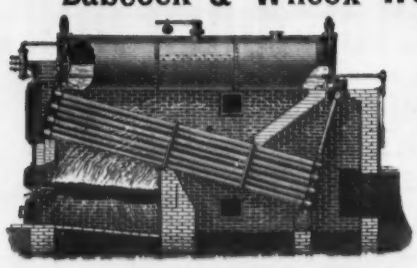

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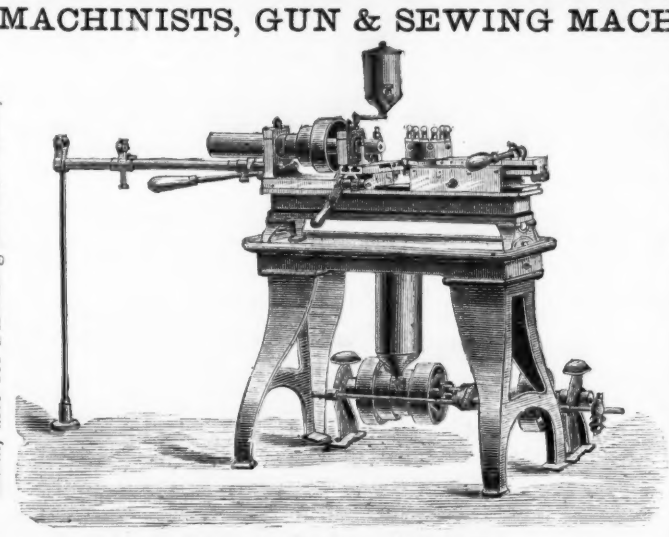

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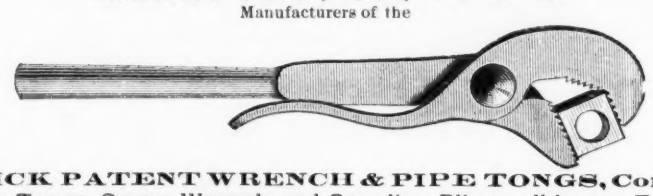

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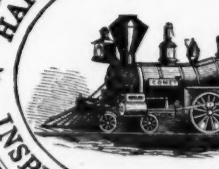

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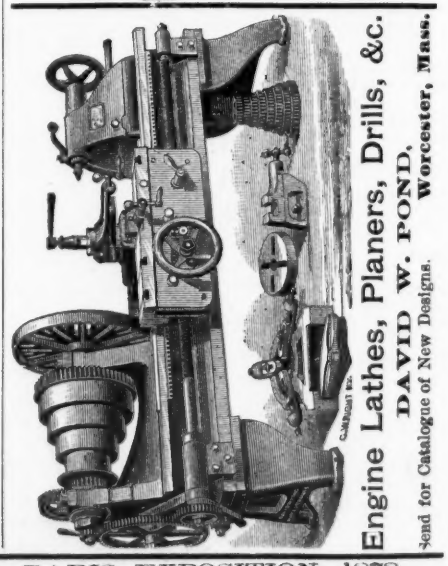

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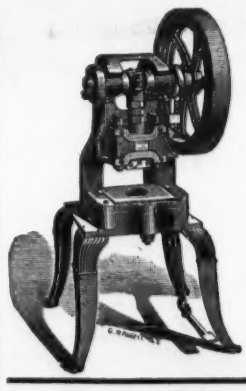

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